Report
Provincial Board of Health
Ontario.
1907

Twenth-Sixth Annual Report

OF THE

Provincial Board of Health

Of Ontario, Canada.

BEING FOR THE YEAR

1907.

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
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1908.

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TORONTO, February 10th, 1908.

To His Honor, SIR WILLIAM MORTIMER CLARK, KT.,
Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOR,

I beg herewith to present for your consideration the Twenty-sixth Annual Report of the Provincial Board of Health of the Province of Ontario, being the transactions of the Board for the year 1907.

Respectfully submitted,
W. J. HANNA,
Provincial Secretary.

TORONTO, February 10th, 1908.

To the Honorable W. J. HANNA,
Provincial Secretary of the Province of Ontario.

SIR,—I have the honor to submit for your approval the Twenty-sixth Annual Report of the Provincial Board of Health of the Province of Ontario, for the year ending December 31st, 1907.

I have the honor to be,
Sir,
Your obedient servant,
CHAS. A. HODGETTS.
Secretary.

PROVINCIAL BOARD OF HEALTH OF ONTARIO.

1907

Minister in Charge of the Department.

Hon. W. J. Hanna,
Provincial Secretary.

Members

Charles Sheard M.D., M.R.C.S., Eng., M.H.O., *Chairman*	Toronto.
Milton Ira Beeman, M.D., M.H.O.	Newburgh
John William Scott McCullough, M.D.	Alliston
Charles Bernard Coughlin, M.D.	Belleville
William John Robinson, M.B., M.H.O.	Guelph
William Robert Hall, M.D., M.H.O.	Chatham
Charles Alfred Hodgetts, M.D., L.R.C.P., Lond. *Secretary and Chief Health Officer of Ontario.*	Toronto.

Bacteriologist in charge of Laboratories.

John A. Amyot, M.D.

Branch Laboratory—Kingston.

W. T. Connell, M.I.

Medical Inspector.

R. W. Bell, M.D.

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Resume of Transactions of the Board during 1907

The Board held five meetings during the year, four regular meetings, one each in the months of February, May, September and December, and a special meeting in the City of London in July. The Board held one session in the month of May in the City of Hamilton when it met to consider the causes incident to the nuisance at Coal Oil Inlet. The pronouncement thereon will be found in the body of the report. The remaining sessions of this quarterly meeting were held in the City of Guelph, where a conference was held with Professors Dean and Harcourt of the Dairy School upon the Milk Question.

The business transacted during the year as shown by the minutes of the Board may be epitomized as follows:

Sewers and Sewerage Systems.—The plans of the sewerage system of the Town of Orillia, action upon which was deferred pending further information from the Engineer.

The plans for the extension of the sewage disposal plant of the Town of Waterloo, which were approved.

The plans for the construction of certain common sewers in the Town of Napanee and Sandwich East, which were not approved.

The plans for the cemetery sewer in the City of Windsor and a system of storm sewers in the City of Woodstock, which were approved.

The plans for the extension of the system of the Town of Bridgeburg were approved of with certain recommendations as to sewage treatment.

Water Supplies.—The plans for the installation of a public water supply in the Village of Elmira to be taken from astesian wells were approved.

Sanatoria.—The plans of the proposed sanatoria for the City of Ottawa and the City of London and County of Middlesex were submitted to the Board by the Honorable the Provincial Secretary and after a careful consideration formal approval was intimated to the Minister.

Cemetery Extensions.—The plans for the extension of two public burial grounds, viz., those of Hespeler and Renfrew, were after report thereon by the Medical Inspector approved.

A petition was received from the Municipality of Dunnville regarding the pollution of the waters of the Grand River by the sewage of the City of Brantford, but owing to the fact that certain examinations of specimens collected by the Engineer of that City were in progress in the Laboratory of the Board, having for their object the formulating of recommendations as to the best method for the treatment of the same, action was deferred.

Petitions.—Petitions in reference to a nuisance existing in the Township of Dover caused by the Pancourt Ditch were considered and after report thereon by two members of the Board the following resolution was adopted—"Having considered the matter of the Pancourt Ditch, situated in the Township of Dover, this Board is of the opinion that it is desirable and necessary as a sanitary measure that the said ditch or drain should be cleaned out and properly deepend, and would recommend that the work be proceeded with as a health measure unless the Township Council proceed at once with the work under the provisions of the Municipal Drainage Act."

Site for Isolation Hospital, London.—The City of London having secured special legislation at the last session of the Legislature, permitting of the erection of an Isolation Hospital upon land adjacent to the Victoria General Hospital at a less distance than that permitted by Section 28 of the Public Health Act. The Board held a special meeting in that city for the purpose of selection of the site and the finding of the Board will be found in the annual report.

RESOLUTIONS OF THE BOARD.

Necessity for certain changes in statutes re Milk Supplies.—"It is "recommended that Section 583, Division 18, Section 23 of the Consolidated "Municipal Act be struck out.

"That Chapter 252, R.S.O., 1907, being an Act to prevent fraud in "the sale of milk in cities and towns, be hereby amended as follows: That "the words 'knowingly and fraudulently,' 1st line, and 'knowingly and "fraudulently,' 5th line, be struck out."

Antitoxin.—"The experience of the past ten years in all parts of the "world having so clearly proved the curative effects of antitoxin in diph-"theria, in the opinion of this Board some means should be devised by which "every physician in the Province can readily secure antitoxin free of charge "for use in the case of indigent or poor patients. We feel that this end "can be attained either by the Provincial Government making a grant "sufficiently large to supply free antitoxin to all parts of the Province, "or by the Provincial Board of Health making such an arrangement with "one or other of the different manufacturers of this product as will enable "local Boards of Health to secure antitoxin for free distribution at a "minimum rate."

Public Sewage and Water Supplies.—"That in the opinion of this "Board it is desirable in the best interests of public health that the Legis-"lature should by enactment require that municipal authorities be prevented "from installing and operating public sewerage systems unless the plans "for the same have been approved of by the Provincial Board of Health as "provided for by Section 30 of the Public Health Act; and this Board would "suggest that it should be made impossible for municipal authorities either "to raise money for either of these purposes or levy or collect rates without "such sanction having been first obtained."

Canning Factories.—"That in the opinion of this Board arrangements "should be made by which closer supervision of the sanitary conditions of "the canning and other factories could be exercised by the Provincial Board "of Health, and the Sanitary Inspection of such institutions brought more "directly under their control."

The several reports of the Secretary, Medical Inspector, Bacteriologist, Toronto, Assistant Bacteriologist, Kingston, as presented to and approved of by the Board will be found in the body of the annual report.

Protection of the Ottawa River from Sewage Pollution.—The following resolution was unanimously adopted by the Board, official intimation having been received that the same resolution had been approved of by the Board of Health of the Province of Quebec, the action following a conference held between representatives of that Board and the Secretary of the Ontario Board.

"That in order to protect the Ottawa River, no future sewerage system "will be approved of by the Ontario and Quebec Provincial Boards of Health "unless the municipalities constructing the same shall agree to make pro- "vision for the treatment of the sewage satisfactory to the Provincial Board "having jurisdiction over the territory.

"That respecting sewerage systems already established no extension "will be approved except on the condition above mentioned, and further "the Ontario and Quebec Provincial Boards will interest themselves in "bringing the municipalities at present pouring raw sewage into the said "river to provide for the purification of the same."

Report of Secretary.

Contagious Diseases, 1906.

To the Chairman and the Members of the Provincial Board of Health:

Gentlemen,—I beg to submit tabulated statement of returns of cases of contagious diseases notified during the year 1906, and deaths therefrom, also deaths from all causes for the same period, and to permit of comparison I also submit similar returns for the year 1905.

It will be noted that the returns cover 91 per cent of the estimated population of the Province, and must not be taken as final. They are simply indicative of the general morbidity from contagious disease and approximate as regards total number of deaths, the figures as presented showing the death rate of the Province to be 13.0 per 1,000 of the population, being 0.2 of an increase over the year 1905.

All of which is respectfully submitted.

Feb. 5th, 1907.

Chas. A. Hodgetts, Secretary,
Chief Health Officer of Ontario.

Cases and Deaths from Contagious Diseases for the Year 1906.

1906.	Population reported on.	Smallpox.		Scarlatina.		Diphtheria.		Measles.		Whooping Cough.		Typhoid or Malaria.		Tuberculosis.		Total deaths from all causes.	Rate per 1,000.
		Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.		
January	2,072,331	150	..	137	4	176	21	31	4	76	10	168	51	165	165	2,447	11.1
February	2,001,010	55	..	120	5	168	23	62	4	143	10	412	45	200	196	2,173	13.0
March	1,884,922	27	..	113	6	169	10	115	3	68	10	243	67	187	180	2,301	14.9
April	2,002,100	53	..	131	3	129	12	256	16	92	8	68	24	189	182	2,295	13.7
May	1,995,477	48	..	112	2	98	16	145	12	205	15	49	13	244	223	2,186	13.2
June	2,057,296	35	..	98	3	190	21	206	6	105	18	42	7	182	171	1,978	11.4
July	1,850,000	24	2	80	2	106	23	68	7	55	6	80	20	146	136	1,669	10.9
August	2,091,183	11	.	45	6	125	8	35	7	119	21	276	72	180	177	2,570	14.2
September	2,070,613	15	..	51	2	116	19	41	3	96	14	668	83	129	129	2,315	13.7
October	2,101,200	9	..	70	7	376	41	119	1	83	19	788	151	165	160	2,370	13.5
November	1,952,100	7	..	107	4	260	45	226	3	21	11	480	113	141	134	2,010	12.3
December	1,961,000	48	..	112	12	203	26	147	7	13	4	178	51	153	143	2,100	12.8
	24,039,232	482	2	1,176	56	2,116	265	1,451	73	1,076	116	3,482	697	2,081	1,996	26,414	13.1

Average population reporting, 2,003,270, being 91% of the Province—making the death rate per 1,000 13.0.

Returns of Contagious Diseases for the Year 1905.

Showing Mortality, Cases by Months and Death Rate.

1905.	Population reported on.	Smallpox.		Scarlatina.		Diphtheria.		Measles.		Whooping Cough.		Typhoid or Malaria.		Tuberculosis.		Total deaths from all causes.	Rate per 1,000 per annum.
		Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.		
January	2,019,590	10	..	223	12	412	67	268	4	27	4	69	21	174	169	2,216	13.1
February	1,935,897	8	..	209	16	270	35	119	2	22	3	43	19	177	165	2,263	14.0
March	1,946,271	16	..	168	8	223	27	154	5	54	5	30	16	208	200	2,417	14.9
April	1,903,402	70	2	157	7	212	27	494	27	45	4	37	10	211	198	2,164	14.6
May	1,980,887	35	..	89	6	220	31	880	1	89	3	31	18	204	200	2,148	13.1
June	2,059,515	19	..	96	5	212	40	420	11	40	8	43	19	210	207	1,933	11.5
July	1,959,311	8	..	52	2	128	12	90	3	80	21	89	19	166	141	1,871	11.4
August	1,990,065	8	1	30	2	132	21	26	4	141	16	256	43	153	147	2,300	13.2
September	2,010,100	14	2	27	1	143	20	32	1	97	13	278	45	153	152	2,128	12.1
October	1,984,157	63	..	96	1	191	29	25	1	36	6	350	48	170	163	2,047	12.3
November	2,010,532	183	..	122	5	267	30	28	3	85	11	210	55	134	134	2,080	12.4
December	1,959,700	123	..	151	5	231	28	40	2	35	6	307	48	172	172	2,116	12.9
		549	5	1,420	70	2,641	367	2,576	61	751	106	1,743	361	2,132	2,051	25,583	12.8

Average death rate per 1,000, 12.8.

Summary of Reports of Local Boards of Health

For the year 1906 (Cities not included.).

CHAS. A. HODGETTS, M.D., Chief Health Officer, Ontario.

County.	Number of towns reporting.	Amount expended for health purposes.	Estimated population reporting.	Number of townships reporting.	Amount expended for health purposes.	Estimated population reporting.	Total amount expended for health purposes.
		$			$		$
Algoma	6	2,312 00	15,160	17	507 00	8,827	2,819 00
Brant	1	....	3,800	5	331 70	13,685	331 70
Bruce	9	594 00	13,965	14	843 66	35,244	1,437 66
Carleton	2	665 00	4,500	8	374 25	23,230	1,039 25
Dufferin	3	499 85	5,000	5	296 65	11,272	796 50
Elgin	4	271 70	4,417	3	71 10	10,609	342 80
Essex	4	350 50	8,243	9	321 00	20,880	671 50
Frontanac	1	75 00	700	9	70 00	8,960	145 00
Grey	4	50 00	5,400	9	2,258 09	25,735	2,308 09
Haldimand	3	40 00	3,100	7	185 20	8,475	225 20
Halton	2	450 00	2,850	4	110 50	12,181	560 50
Hastings	3	324 15	2,897	13	1,143 41	25,072	1,467 56
Huron	5	118 50	6,730	13	528 65	31,968	647 15
Haliburton	......	....	....	5	6 25	2,539	6 25
Kent	3	199 95	5,400	6	447 16	19,247	647 11
Lambton	3	50 00	2,797	7	296 80	22,900	346 80
Leeds and Grenville	3	1,051 00	13,125	11	207 45	44,936	1,258 45
Lanark	2	75 00	4,800	7	349 65	9,633	424 65
Lincoln	1	....	800	6	123 25	8,546	123 25
Lennox and Addington	1	30 00	500	4	44 75	6,525	74 75
Middlesex	3	125 80	2 600	11	424 20	33,851	550 00
Muskoka	2	96 27	3,350	10	169 70	16,936	265 97
Nipissing	3	247 27	7,260	13	106 25	9,232	353 52
Norfolk	4	59 00	5,560	6	108 60	14,008	167 60
Northumberland and Durham	6	631 90	11,280	14	1.027 50	34,336	1,659 40
Ontario	5	750 29	12,437	8	613 52	23,451	1,363 81
Oxford	3	654 35	6,850	12	473 75	28,864	1,128 10
Parry Sound	1	125 00	4,000	13	298 15	10,018	423 15
Peel	2	130 89	4,250	2	25 00	6,087	155 89
Perth	2	....	3,371	8	491 90	21,137	491 90
Peterboro	2	592 00	2,700	6	135 00	7,353	727 00
Prescott and Russell	1	40 00	2,897	6	464 20	21,074	504 20
Prince Edward	1	....	4,000	6	112 00	9,153	112 00
Rainy River	2	369 15	3,200	9	35 00	5,079	404 15
Renfrew	3	1,390 00	8,764	13	183 00	11,472	1,573 00
Simcoe	4	145 50	10,452	13	953 15	37,181	1,098 65
Stormont, Dundas and Glengarry	3	187 00	7,985	4	172 00	15,329	359 00
*Thunder Bay	1	*26,000 00	10,421	1	....	575	26,000 00
Victoria	5	515 15	10,400	8	470 65	14,535	985 80
Waterloo	4	1,878 18	26,259	3	430 00	12,616	2,308 18
Wellington	5	71 00	5,231	12	693 38	29,503	764 38
Welland	5	1,213 49	15,441	5	89 50	10,748	1,302 99
Wentworth	1	18 00	600	9	773 90	24,653	791 90
York	9	360 50	15,894	6	517 75	26,506	878 25
	137	42,757 39	288,286	360	17,282 62	764,161	60,040 01

*Outbreak of typhoid at Fort William, 832 cases reported in annual report.

The total amount expended in 1906 for health purposes in 497 municipalities, including cities, is $60,040.00, representing a population 1,052,447, making an average of 5.7 cents per head. If we deduct $26,000 spent by Fort William on typhoid the average would only be 3.3 cents.

County.	Municipality.	State what common or other sewers were constructed during the year, and, if any, did Council comply with Sec. 30 of Act and submit plans to Provincial Board.	Give date of installation of System and number of household and factory connections? Estimated daily outflow?	Give date of installation of Public Water System? Source? Number of household connections? Number of factory and other connections? Estimated daily consumption?
Algoma	Sault Ste. Marie.	5,000 laterals submitted W. M. Chipman, 1901.	1901, 1902, 1906, 540, 30,000.	1894-5, Tagona Light and Water Company, 1,200, 3,000,000.
	Gore Bay	None.		1899.
	Steelton			Being installed.
	Thesalon			1899, Lake Huron.
Brant	Brantford			1889, Springs.
	Paris			1880, Springs. 500, 10, 300,000
	Dundas			1888. Gravitation springs.
Bruce	*Lucknow			For fire purposes only.
	Southampton			1902. Lake Huron, 200, 6, 50,000.
	Wiarton			1889, Colpoy's Bay.
	Chesley	Sewers for cellars only.	1 short sewer, 5 house connections.	
	Walkerton	A branch sewer 850ft. long.	1890, 150	1890, Springs, 320, 20, 288,000.
	Teeswater			1889.
	*Paisley	None.	None.	Fire protection only, Saugeen River.
	Port Elgin			Installing system now, Lake Huron.
	Kincardine	None.		1895, Lake Huron, 308. 5, 80.000.
Carleton	Ottawa	Plans app'd by P. B. of H , 1906.	1902, 15,200, 130, 11,500,000,	1874, Ottawa River, 15,312. 130, 11,700,000
	Hintonburgh	None.	None.	1899, Ottawa River, 650, 3.
	Ottawa, East	3 sewers.		1904, 350, 4, 300,000.
Dufferin	Orangeville			1894, Springs, 500.
	Shelburne			1886, Gravitation.
	Grand Valley			1889, Wells, 200, 6,000.
Elgin	St. Thomas			1890, Springs & Kettle Creek, 2,669, 250, 1,500,000.
	Aylmer			1888-1901, Springs, 300, 10.
Essex	Kingsville			1894, Lake Erie, 180, 8, 30,000.
	Windsor			1873, Lake Erie, 2,800.
	Leamington			1890, Artesian wells, 289.
	Amherstburg			1891, Detroit River, 118.
	Essex			1891, Artesian Wells, 300, 7, 40,000.
	Walkerville	None.		——Walkerville Waterworks Company.
Frontenac	Kingston			1850, Lake Ontario, 3,800 —— 2,250,000.
Grey	Owen Sound			1880, Springs,
	Meaford	One under consideration.		1894, Georgian Bay, 600, 6, 80,000.
Haldimand	Dunnville		1891.	1891, Grand River.
Halton	Georgetown			1891. Gravitation from springs.
	Milton			1887, Springs.
Hastings	Belleville	One Plan submitted to P. B. of H.	1895.	1886, Bay Quinte, 1,225, 1,200,000.

County.	Municipality.	State what common or other sewers were constructed during the year, and, if any, did Council comply with Sec. 30 of Act and submit plans to Provincial Board.	Give date of installation of System and number of household and factory connections? Estimated daily outflow?	Give date of installation of Public Water System? Source? Number of household connections? Number of factory and other connections? Estimated daily consumption?
Hastings, *Con*...	Deseronto.......	....	....	1896, Springs.
	Trenton	....	....	1895, Bay Quinte.
Huron	Seaforth	....	....	1879.
	Goderich	....	....	1889, Lake Huron.
Kent	Chatham	....	....	1890.
	*Tilbury	None.	None.	1887, Baptiste Creek, not for drinking purposes.
Lambton	Alvinston	....	....	1895, Fire purposes only.
	Watford	....	....	1893.
	Sarnia	....	....	1876, River St. Clair.
	Petrolia	....	....	1895, Lake Huron.
Leeds and Grenville...	Brockville	....	1889-1355.	1882, St. Lawrence River. 1961, 2,000,000.
	Prescott	....	1900, 200.	1900, St. Lawrence River, 450, 180,000.
	Gananoque	....	....	1890, River.
Lincoln	St. Catherines...	Two	....	1879, Lake Erie, 2,700, 170, 2,000,000.
	Beamsville	....	1880.	1894, ——40. 10.
	Niagara	....	....	1891, Niagara River.
Lanark	Smiths Falls....	....	....	1895, Rideau River.
	Perth	....	....	1897, River Tay.
Lennox and Addington..	Napanee........	....	....	1890, Napanee River.
Middlesex	London	....	1854-1896, all houses connected, 1,000,000 gals. per 24 hrs.	1878, Springs at Springbank, 10,514, 3½ mill. gallons.
Muskoka	Bracebridge	....	....	1894-5, Springs, 459, 8, 37,500.
	Huntsville	....	....	1897, Lake Vernon.
Nipissing........	Sudbury........	....	....	1896.
	Sturgeon Falls ..	850ft. System designed by W. Chipman.	1903-4, 81.	1903, Sturgeon River, 445, 6, 20,000.
	North Bay	....	....	1892, Trout Lake?
Northumberland and Durham	Port Hope	....	....	1874-1896, Lake Ontario, filtered, 425, 8, 155,000.
	Cobourg	Only repairs.	Generalsystem 1902.	Owned by Company.
	Campbellford...	....	....	1889, River Trent.
Oxford	Ingersoll	None.	....	1890, Springs, 700.
	Woodstock	....	....	1886, Springs,
Ontario.........	Whitby	None.	None.	1904, Lake Ontario.
	Oshawa	Generalsystem in 1904-6, some extensions.	1904-5, 220-2.	1905, Lake Ontario, 260, 6, 200,000.
Parry Sound....	Parry Sound....	....	None.	1890, The Sound, 425, 10, 90,000.
Peel...........	Brampton	None.	None.	1882, Snell's Lake, 100, 10, 100,000.
Perth	Listowel	....	....	1904, Artesian wells, 175, 3, 80,000.

NOTE. * For fire purposes only.

County.	Municipality.	State what common or other sewers were constructed during the year, and, if any, did Council comply with Sec. 30 of Act and submit plans to Provincial Board?	Give date of installation of System and number of household and factory connections? Estimated daily outflow?	Give date of installation of Public Water System? Source? Number of household connections? Number of factory and other connections? Estimated daily consumption?
Perth, *Con*	Stratford	$1\frac{3}{20}$ miles, any change from McDougal's plans was app'd by P. B. of H.	1895, 950,000.	1883, River Avon and wells, 888, 94, 650,000.
	Mitchell			1873, River Thames.
Peterboro'	Peterboro'		1892.	—— Otonabee River.
Prescott and Russell	Rockland	None		1900, Ottawa River.
Prince Edward	Picton	Plans submitted, no work done yet.	Not yet installed.	1899, Bay Quinte, 100, 50, 162,000.
Rainy River	Fort Frances	Constructing system now.		Installing system now.
Renfrew	Renfrew	System submitted to P. B. of H.	1897, 400.	1897, Bonnechere River, 600, 8, 500,000.
	Pembroke			1894, Ottawa River.
	Arnprior	3 constructed during the year, No.		1901, Madewaskle River, 591, 9, 100,000.
Simcoe	Collingwood	Plans app'd, work under construction.		1889, Georgian Bay, 1,500, 1,100, 500,000.
	Stayner			1898, Spring from mountain, 15, 10,000.
	Creemore			1905, Springs, 50, 5, 4,000.
	Beeton			1893, Spring creek by gravitation, 130, 3, 150,000.
	Penetang			1890, Springs.
	Alliston			1893, Boyne River.
	Barrie			1890, Artesian wells.
Stormont, Dun. and Glen.	Cornwall	None.	1888, 1,100.	1886, River St. Lawrence. 1,000, 12, 800,000.
	Morrisburgh			1887, River St. Lawrence.
	Alexandria			1895, River De Lisle.
Thunder Bay	Fort William	2,600ft. contracted for the year 20,000ft completed, plans submitted to P. B. of H.	2,000.	1898, Kaministekewa River, 1,600, 25, 500,000.
	Port Arthur			—— Spring creek.
Victoria	Lindsay	4 sections added, plans app'd by P. B. of H	1899, 400, 18, 18,000.	1892, River Scugog, 520, 25, 400,000.
Waterloo	Berlin	No main sewers, lateral connections to buildings.	1891, 592,288.	1888, Artesian wells, 1,950. 800,000.
	Preston			Being installed.
	Galt	11 miles of sewers laid down in conformity with the P. B. of H.	1905, 160.	1891, Artesian wells, 1,800, 78, 800,000.

County.	Municipality.	State what common or other sewers were constructed during the year, and, if any, did Council comply with Sec. 30 of Act and submit plans to Provincial Board?	Give date of installation of System and number of household and factory connections? Estimated daily outflow.	Give date of installation of Public Water System? Source? Number of household connections? Number of factory and other connections? Estimated daily consumption?
Waterloo, *Con*...	Waterloo			1889, Artesian wells and springs.
Wellington	Guelph			1880, Springs and river.
	Mount Forest			1898, Wells, 320, 4, 50,000.
Welland	Welland			1888, Lake Erie.
	Port Colborne			1898, Lake Erie.
	Niagara Falls		1896, 1,200, 1,750,000.	1889, Niagara River, 1,700, 60, 2,500,000.
	Merritton			1888, Lake Erie.
Wentworth	Hamilton	Comprehensive plans, annex app'd by P. B. of H.	1857, 7,000,000.	1858, Lake Ontario, 1,560, 6,000,000.
	Dundas			1888, Gravitation by springs,
York	Toronto			1849, Lake Ontario.
	Newmarket			1887, Artesian wells.
	North Toronto			1902, Springs.
	East Toronto	None.		1905, Lake Ontario, 500, 8, 135,000.
	Toronto Junction			1889, Lake Ontario.
	Markham			1890, Springs.
	Stouffville			1898, Springs.
	Aurora	One large sewer.		1888, Artesian wells, 100, 5, 100,000.

The number of cities and towns having public water supply is 114 as compared with 90 in 1897.

Annual Reports of Health Officers

Of the following Cities for the Year 1906 as received by the Provincial Board of Health.

NIAGARA FALLS.—(REPORT OF CHAIRMAN OF LOCAL BOARD OF HEALTH.)

In accordance with Public Health Act, I herewith submit for your information statement of work done by your Board of Health during the year and report of sanitary condition of the city.

Sanitary conditions. I am pleased to state that no serious infraction of the Health Act occurred during the year; the general tendency of the citizens being to observe the regulations, and carry out the orders of the Sanitary Officer. The general collection of garbage, the activity and frequent visits to all parts of the city by the Sanitary Inspector, have kept the conditions fairly good, but constant vigilance is absolutely necessary, especially during the summer months, in order that the city may be kept in that clean and sanitary condition that is so necessary to the public health, and the general of the citizens in this connection I desire to express the hope that the incoming council will promptly take hold of Main street sewer and reach a solution of the difficulty. The lack of proper drainage has been the cause of very insanitary conditions in this locality for some time. This cannot continue; prompt measures are necessary and will have to be taken soon to remedy this condition of affairs.

Milk Supply. The milk supply of the city has continued to receive the careful consideration of your board. During the year all dairies have been visited, the food, water supply, and condition of cattle have been carefully looked after; frequent tests have been made, the milk so tested being taken from wagons on the street and in nearly all cases, the milk has been found pure, and registering above the percentage of butter fat required by law. When the reverse has been the case the milk has been promptly confiscated. This work has been done by Dr. Watson acting for the board, and I desire to testify to the careful and thorough manner in which the duties are performed.

Garbage Collection. The collection of garbage is a great convenience and tends very much to good sanitary conditions but the manner of collection does not give satisfaction; much improvement is necessary and will have to be made. Your board will, I believe, early in the year, make some recommendations and suggestions for an improvement of the system. The disposal of garbage and night soil is also a live issue, and I trust that solution of this difficulty may also be had.

Water Supply. Referring to our water supply, I desire to call the attention of the council to recent amendment to Public Health Act whereby the city can obtain jurisdiction to prevent pollution of the river by defining a limit the necessary distance outside the limits of the city. I would recommend that the necessary action be taken by the council in this direction as soon as possible.

Plumbing and Sanitary Inspector. The rapid growth of the city and the great activity in building operations have added very much to the duties of the Plumbing and Sanitary Inspector, but they continue to be performed in a careful and satisfactory manner.

My relations with your Medical Health Officer have been very satisfactory during the year. He has at all times been prompt in the discharge of the duties devolving upon him, regular in attendance at all meetings and very zealous in looking after the sanitary conditions of the city and its citizens.

ST. CATHARINES.—(REPORT OF CHAIRMAN OF LOCAL BOARD OF HEALTH.)

Pursuant to the provisions of the Public Health Act, I have the pleasure of submitting my report as to the sanitary condition of the City of St. Catharines, up to the fifteenth day of November, A.D. 1906.

The low rate of mortality, due to contagious disease, is a gratifying evidence of the absence of those Pathogenic Germs to which typhoid fever, and other enteric affections, owe their origin. For, although Dr. Amyot, the skilled Bacteriologist of the Provincial Board of Health, has, on more than one occasion, reported the presence in our public water supply, of the colon bacillus, no serious results have followed its use by our citizens.

This seems to indicate the freedom of the water in our reservoir from the typhoid bacillus, or other disease producing bacteria.

The extension of the sewers, and the filling up, and closing of many malodorous vaults, have done much towards improving the condition of the atmosphere; conditions upon which various affections of the lungs and air passages, in general, mainly depend.

As rapidly as the funds of the Local Board of Health would permit, Automatic Flush Tanks have been installed, and the sewers have thereby been kept free from the noxious gases arising from putrefactive fermentation.

Two of these Flush Tanks have been installed during the past summer: one at the junction of Welland Avenue and George Street, and the other at the junction of Welland Avenue and Henry Street. It is the intention of the Board to place one more before the winter sets in, near the junction of Welland Avenue and Geneve Streets. At the present time sixteen (16) of these tanks have been installed, and the Sanitary Inspector, and the Street Superintendent, inform me that they are all in good working order.

It speaks well for the honesty and skill of the plumbers of St. Catharines, that no zymotic disease, the origin of which, in many cases, can be traced to defective plumbing, permitting sewer gas to gain entrance into houses, and thus rendering the air therein foul and unsanitary, has existed this year in St Catharines.

Great care must be exercised to keep the streets that have been recently paved, thoroughly clean and wholesome. This is necessary, as the absorption of organic impurities of all kinds, is prevented by the impermeable nature of the materials used in paving, from mingling with the soil, and becoming deodorized, and disinfected thereby. The unsanitary condition, thus induced by constant sweeping and cleaning, may be overcome, and the rich fertilizing materials thus collected can, and no doubt will be used to enrich the soil of the Garden City. So much eager attention is paid, in England, to the collection of this organic waste, that, I have been credibly informed, persons do not even allow the material to reach the ground, but, hat in hand, intercept it in transit, to be utilized where it will do the most good.

Some months ago, I had a visit from Dr. Hodgetts, the Secretary of the Provincial Board of Health, Dr. Bell, Sanitary Inspector, and a Mr. Holmes, Inspector of manufactories. The object of their visit being to consult me in regard to the sanitary surroundings of the boarding houses, occupied by employees, who were engaged in canning fruit and vegetables. These gentlemen condemned, in vigorous terms, the want of cleanliness of the premises and the lack of sufficient space to furnish the 400 cubic feet of air, which each individual requires to maintain a healthy condition. They were not satisfied with any of the boarding houses, occupied by these employees, but some of them were condemned unsparingly, as being worse than the others.

I instructed the Sanitary Inspector, Mr. Boulden, to visit these houses in which the employees were domiciled, during the canning season. He did so, and I have attached the result of his visitation to my report. A careful perusal of Mr. Boulden's report will enable anyone who takes an interest in sanitary and humanitarian objects to ascertain how far the manufacturers have complied with law in the manner of housing their employees, so as to meet the sanitary requirements of the Act, respecting the Public Heath, or the reverse.

The water furnished to our citizens from the Welland Canal, via Lake Gibson, the Local Board of Health have had examined several times during the year by Dr. Amyot, Bacteriologist of the Provincial Board of Health, and, strange to say, although the colon bacillus has been found on several occasions, which indicates the presence of sewage and is often associated with typhoid germ, yet the users of the city water have been remarkably free from enteric affections during the past year. It is fair to infer, I think, that we owe our immunity to the absence of the typhoid bacillus in the water we use for domestic purposes, or that the typhoid germ is so attenuated by dilution that it cannot overcome the defensive power of the white corpuscles of the blood, which can successfully defend the system, unless the poison which enters the body is too strong to be overcome by our natural forces.

The initiative taken by St. Catharines to prevent spitting on the sidewalks, in public buildings, and public conveyances, has been followed by several towns and cities in both Ontario and Quebec; but I am sorry to say that the efforts of other places to enforce this ordinance are more strenuous, and effective, than perhaps have hitherto existed in St. Catharines. The suggestions of a celebrated occulist, that perhaps an automatic policeman would prove more successful than the present brand, who he thinks may be suffering from a mild attack of expectorator amanurosis. If the law were properly lived up to, it would tend to lessen the numbers of cases of pulmonary tuberculosis, as well as doing away with a most filthy and disgusting practice. If the worthy guardian of the peace that keeps watch and ward over the entrance to the Opera House, were to be furnished with a broom, and some disinfectant, to cleanse and purify the sidewalk, and with a good sized club, to be used when necessary, he might assist in effecting this more thoroughly.

The number of contagious diseases reported for the year, is an indication of the success which has attended the efforts of the Local Board of Health, in conjunction with the Mayor and Council, and the water commissioners, in maintaining the purity of the water supply, and also the freedom from various gases of putrifaction, which cleanliness of the streets and extension of the system of sewers, accomplishes for the atmosphere which surrounds us.

The reports of the Secretary and Inspector, which accompany mine, will give fuller details, and will prove of interest to those who take an interest in sanitary statistics.

I wish it were in my power to report progress in regard to the hoped for hospital for contagious diseases.

Our immunity from this class of affections of recent years, should not blind us to the necessity of taking early steps to erect an isolation hospital. It is well to remember the remark of Lord Lyndhurst, the Nestor of the House of Lords, "In time of peace prepare for war." The ladies who so successfully collected funds for this worthy purpose, should infuse some of their strenuousity and charitable feelings into the breasts of our city fathers, in order that no more time be lost before a beginning is made.

The Secretary and Inspector have been earnest and industrious in the discharge of their duty, and I have no doubt. but that the Secretary as soon as he becomes familiar with the routine of his office, will do all that he can to give effect to the requirements of the Health Act. During this last year we have lost our late Secretary, Mr. John S. McCelland, and I think it would be eminently fitting and proper to pass a resolution, voicing our sense of the loss we have sustained, and expressing the same to his wife and family.

STRATFORD.—(REPORT OF DR. J. A. ROBERTSON, M.H.O.)

Again I am pleased to congratulate the citizens of Stratford, on its healthy condition during the past year. For the last number of years, congratulations thereon seemed to have been in order, but the past year proves more deserving, than any of the previous ones. Our population has materially increased, and our death rate diminished, 9 per cent. being the rate from all causes.

The death rate of the year was augmented by the number of infants who died, there being no less than thirty-eight recorded under one year old. Quite a number died within the first two weeks after birth, the remainder were chiefly the victims of "gastro enteric's" trouble, so prevalent in the city during the hot sultry season. This shows that 31 per cent. of the deaths registered in the city occurred during the first year of life. Leaving out those who arrived at the chloroform period and over, the infant mortality of the first year was only eight less than all between one and sixty. Old age still holds its own, there being 38 who lived over the sixtieth year. Last year there were 16 who died from old age out of 127.

Consumption, notwithstanding that the public are becoming more alive to its contagious nature, still holds a conspicuous place in the death rate, one out of every 12 deaths recorded being due to that disease. As more care is exercised and more attention given by the people towards its prevention, the percentage per ratio will decrease. Of the preventable diseases typhoid fever takes the lead, 58 cases occurred during the year. Compared with other municipalities in the Province we have cause for congratulation, and, also from the fact that only two deaths are recorded from that disease. There seems to be a general impression caused chiefly through more authentic reports, that there were more cases in the city than in previous years, such is not correct, however, as there were 97 cases with 4 deaths recorded during 1901.

Town officers have been unable to ascertain the cause of the disease in the majority of the cases as they were not promptly reported. The profession are now aware that it is as incumbent on them to report typhod as promptly as any other contagious disease. I would like to ask the profession to be more explicit in registering the cause of deaths, as the terms heart failure, indigestion, stomach trouble, dropsy, etc., are somewhat vague.

We are again favored in having so few cases of the much dreaded diseases diphtheria and scarlet fever, only four cases of the former and nine of the latter being reported during the year. Strict vigilance and thorough isolation were the chief instruments in preventing their spread.

Our water supply during the past few months has not been up to the mark. Owing undoubtedly to unpreventable causes. The commissioners are, however, doing all in their power to remedy the evil, and complaints will soon be a thing of the past.

Next to our water supply, which bears an important place as regards the health of the community, is the milk sold. The milk provided for consumption should be obtained under the best hygienic conditions. The general impression amongst our milk vendors, is that if their milk register a percentage of butter fat sufficient to comply with the government's standard. their responsibility is complete. Such however is not the case. The public demand more. The consumer has a right to demand that the milk furnished him be clean. Have the vendors given this matter any consideration? It would be interesting to know the preliminary toilet of the milker. Does he thoroughly wash his hands and put on a milking gown? Does he carefully and systematically wash the udder and teats of the cow? Is he careful that the vessels used for milking are properly cleaned? Is the vendor careful that no contamination of the milk takes place, either at its source, in its transit and in its distribution? It should be made compulsory for every producer of milk to procure annually a license before he can engage upon dairy farming, and then to make the granting continuance or renewal of such license dependent upon the vendor keeping his surroundings in a proper sanitary condition and his cows healthy.

To insure the latter condition he should see that the byers were properly ventilated, avoiding unnecessary drafts. That there was the necessary supply of sunlight, and that the walls and ceiling of the stables be thoroughly whitewashed every Fall. He should also see that proper food be used, that no musty or dusty matter be left in the mangers.

The granting of such license by the city would place the vendors more under the control of the medical officers and a more stringent standard of cleanliness might be enforced.

Ottawa.—(Report of R. Law, M.D., M.H.O.)

I beg to present the report of the Health Department for the year ending 31st October, 1906.

I am pleased to be able to report a continual improvement in the city's health as indicated by the tables appended. During the year 1,709 births were registered. The total mortality for the year has been 1,098, with the estimated population of 67,572, giving us a mortality rate of 16.2 per thousand. Five years ago the mortality was 1,273 with a population of 61,000, a mortality rate of 20.8 per thousand.

The number of contagious diseases reported is as follows:—
Diphtheria, 82.
Scarlet fever, 73.
Typhoid not complete, 28.
Smallpox, none.
The mortality from the chief infectious diseases is as follows:
Tuberculosis, 104.
Whooping cough, 21.
Typhoid, 14 (including cases from outside).
Diphtheria, 11 (including cases from outside).
Measles, 7.
Scarlet fever, 1.

In the diphtheria mortality all but one were due to diphtheretic croup and delay in calling for medical attendance, they being considered by parents as simple croup until too late to save the child.

Tuberculosis an infectious, preventable and curable disease has been responsible for 104 deaths, 10% of the total mortality. This is the most serious question confronting your board.

Five years ago the mortality from scarlet fever and diphtheria was 117, you provided measures for their proper management, this year the mortality from these diseases is ten. With similar outlay and treatment, approximately the same results should be obtained in tuberculosis.

I think this board should recommend the passage of civic by-laws, calling for the private notification of cases of tuberculosis and the observation of the necessary precautions for the prevention of its spread, furthermore, the provision of a place for the treatment of all cases where proper treatment cannot be provided at home. The local Anti-Tuberculosis Society is endeavoring to have such a place provided. I think their efforts should receive the hearty co-operation of this board.

Practically one-third of the total mortality consists of children under one year. A large number of these children might be saved by education of the mothers, upon the essential points of the care of infants, through the issuance of the booklet of instruction to the mother as each birth is registered. As the heavy summer mortality in these children is due to lack of means for preserving milk, we might well follow the example of the City of Rochester, where for an annual outlay of $1,000.00 they are providing during the summer months milk especially prepared for infant feeding at the same price as the regular milk.

For the proper inspection of cattle and appointments of the dairy farms supplying the city, provision for the employment of a veterinary sugeon should be added to our estimates.

As the guaranteed purity of our water is of the most importance, I would recommend that Ottawa join with Hull, in an appeal to their respective Provincial Authorities, to prevent the pollution of its source.

I present herewith the report of the Sanitary Inspector.

I have much pleasure in testifying to the faithful services of the staff of the hospital and office during the year.

PETERBOROUGH.—(REPORT OF DR. J. BINGHAM, M.H.O.)

In presenting a brief annual report of the city, during the year 1906, it is highly gratifying to be able to say that during the year we were exceptionally free from any epidemic scourge of infectious diseases. Only four cases of diphtheria, and ten mild cases of scarlet fever were reported during the year. The number of deaths in the city in the last year, was 248, but many of these were brought to the hospitals here from outside municipalities and should not be reckoned in with the mortality of the city, and if these are deducted it will leave Peterboro' with a fair average bill of mortality.

The following are the causes of the deaths which occurred in the city during the year that is past: Accident, old age, heart disease, croup, appendicitis, pneumonia, cystitis, tuberculosis, congestion of the lungs, brights disease, bronchitis, marasmus, diabetes, hemorrhage of the lungs, mania, anemia, convulsions, laryngitis, apoplexy, epilepsy, meningitis, measles, inflammation of the bowels, cirrhosis of the liver, cancer, paralysis, asthma, nephritis, cholera infantum, hemiplegia and diphtheria.

The hearty co-operation of the citizens of Peterboro' with this board, has done much to increase the sanitary condition of the city. Nearly everyone, now, is accepting the fact that the best protection against sickness is to be found in absolute cleanliness in the home. The cellar should be kept dry and clean, and should at all times be kept strictly free from decaying animal or vegetable matter. Every room in the house should be filled daily with fresh air, and if possible with plenty of sunlight. No rubbish heaps or decaying matter should be suffered to remain in back yards, or any place near the dwelling house. If these rules are faithfully observed, together with others which will suggest themselves to all intelligent citizens, Peterboro' with a thrifty and contented population, will continue to rank high among the healthiest cities of the Dominion.

WOODSTOCK.—(REPORT OF DR. A. MCLAY, M.H.O.)

In accordance with the provisions of the Public Health Act, I beg to submit the following as my annual report, *re* the sanitary condition of our city and health of our citizens, for the year ending November 15th, 1906.

I am pleased to inform you that the health of our ctizens during the year has been comparatively very good. No epidemic of contagious or infectious disease has visited us, and the few sporadic cases of scarlet fever, measles, diphtheria and typhoid fever, which cannot be avoided, were, under the watchfulness of your board, through isolation and the intelligent co-operation of our citizens prevented from spreading.

The great majority of our citizens are to be congratulated on the interest they taken in sanitary matters as may be observed in their beautifully kept lawns and clean premises.

Some of the back lanes of our business places are not kept in as sanitary condition as they ought to be. Beautiful fronts and filthy rears are not compatible. I would again recommend the draining and grading of said lanes thereby protecting the health of those occupying buildings adjacent thereto.

The scavangers have done good work during the year, but, owing to lack of a suitable dumping ground—which I trust will soon be provided—noxious material has been removed from one place and deposited elsewhere, to the injury of others. For example, the removal of the filth from Dundas Street to the lot adjacent to the market.

We congratulate you on the extension of our sewer system, the grading and improvement of our streets and extension of sidewalks, all adding to the sanitary condition of our city and comfort of our citizens.

As imperfect plumbing is injurious to the public health; we would recommend that an Inspector of plumbing be appointed. He doubtless would be of great benefit from a sanitary as well as a financial point of view.

I am pleased to inform you that tuberculosis is on the decrease. Five years ago the mortality from said disease was eighteen. Since then a gradual decrease has taken place, this year being only three, doubtless due in a great measure to the intelligence of our citizens, in the proper disposal of sputa and the action of your board against spitting on sidewalks and in public places. We would recommend that your by-law *re* spitting, be more rigidly enforced, especially at the Post Office, Opera

House and other public places, and that prohibition notices against spitting be distributed more freely throughout the city.

Byers, herds and water supply of those supplying milk to our citizens have been inspected by our veterinary surgeon twice during the year. His report, with one or two exceptional clauses, has been very favorable.

We would recommend that all wells used for dairy purposes, by those supplying milk to our citizens, be cleaned out once a year, and that your milk by-law be so amended as to include the same.

Milk was tested seven times during the year, and with two exceptions was up to the standard in butter fat. On one occasion formaline was found in three samples.

Owing to the general use of preservatives throughout the Province, and the delusive names of the same, we would recommend the government to pass strong measures for the prevention of their use, and that in cities and towns a government official make an analysis of the milk supplied, twice during the year, in the warm season.

Number of deaths during the year exclusive of premature and still born 124, or a fraction over 12 per thousand, a low mortality, 47 dying between the ages of 70 and 95, 20 dying between ages of one hour and 4 years.

No. dying from	heart disease	18
“	heart failure	10
“	pneumonia	8
“	asthma	2
“	whooping cough	1
“	apoplexy	2
“	paralysis	3
“	cancer	9
“	tuberculosis	3
“	typhoid fever	3
“	convulsions	5
“	cholera infantum	4
“	liver disease	2
“	nephritis	2
“	peritonitis	2
“	intestinal obstruction	4
“	meningitis	4

There were no deaths from diphtheria, measles or scarlet fever.

Permit me to say in conclusion that isolation wards for the treatment of infectious and contagious diseases are much needed. Active co-operation of your body and the hospital board for said purpose would be hailed with delight.

We have reason to be thankful and congratulate ourselves on the health of our citizens as compared with that of many places throughout the Province.

Woodstock has properly gained the name of being one of the most beautiful and healthy cities in the Dominion, and ought to be kept in the vanguard of sanitation.

Report of Secretary of Provincial Board of Health.

CHAS. A. HODGETTS, M.D., Chief Health Officer of Ontario.

It is not my intention to weary with any lengthy report, but I feel it a duty to direct your attention to several matters which in my opinion are of public importance from the standpoint of the health of our people.

The Milk Supplies of Cities and Towns. For some time I have felt the need which existed for some further action being taken by the Board in the promulgation of some standards, not only as regards the milk as generally sold in respect to the percentage of butter fat and the bacterial count, but also as to the health of the cows, the cleanliness of the cow sheds, the purity of the water, the collection, storage, transportation of the milk and its delivery to the consumer.

If for no other reason than for the protection of the lives of the infants and children of Ontario, surely this Board acting for the public and in the interests of those it is here to protect as to health and life, should take some firm and decisive stand in the matter.

The existing condition, while no worse than in many other countries is yet far from what it should be, and the fact that it is so is not an excuse sufficient to warrant a course of non-interference. The conditions are remediable and this Board as the highest sanitary body in Ontario should promptly consider the matter in the interest of the consumer.

Smallpox and Vaccination. The continuance of smallpox during the past summer only emphasizes the fact that there is in this province an unvaccinated population, and so long as this condition continues little hope can be held out that this disease will cease from our midst.

The misstatements and distorted facts of a small coterie of those opposed to the practice of vaccination has lulled a small portion of the public into a hypnotic state from which they and the rest of the neglectful public will be rudely awakened by an outbreak of variola simulating in its virulence the Montreal outbreak of 1885-6. Already it has been our fortune to meet with misguided ones who, in their ignorance and simplicity listened to the false prophets and ignored the one thing necessary, have subsequently fallen victims to smallpox and only then learned of the blessedness of the truths of Jenner—and now seamed and scarred, curse the men and women who caused their fall from the paths of scientific rectitude.

To keep the public better informed on this subject I would suggest the issuing of a *poster* which will fully and yet simply set forth the true facts as to the protective value of vaccination against smallpox, such for instance as that recently issued by the Illinois State Board of Health, a copy of which has recently been received and is herewith submitted.

The Installation of Water Works Systems. The custom is becoming more general for municipal authorities to ignore the decisions and recommendations of this Board in respect to the installation of public water supplies and to proceed upon lines not approved of by this Board. Two instances will serve to illustrate what I mean in this particular:—

(*a*) A town submitted the engineer's plans looking to the taking of the supply from a source which at certain seasons of the year must be contaminated.—and the danger must be an increasing, not a diminishing one—The Board approved of the plan with the proviso that the water be filtered. The system, I believe, is being installed without this safeguard.

(*b*) The Board approved of the plans submitted by a town council, but instead of taking the water from the source approved of, another source has been selected which is known to be contaminated and which has already been condemned.

Here are two instances where the ratepayers of two towns have foisted upon them by their municipal councils water supplies which are not and cannot under the existing conditions fail to be other than a menace to the public health of the inhabitants—who are taxed and pay for what this Board has not approved—and yet under the law as it now stands there is no satisfactory remedy. What is required is some legislation which will make it impossible for the municipal council to float their bonds unless the scheme in its entirety has been approved of by this Board, or possibly the members of councils collectively and individually could be held legally liable for damages whenever they sanction action contrary to the expressed wish of this Board.

If some such action is not taken there is nothing to safeguard the health of the public not only of the municipality concerned, but of those who from time to time visit therein.

Installation of Common Sewers and Sewerage Systems. Similar remarks will apply to the construction of common sewers and the installation and extension of sewerage systems—only here the dangers are greater because of the fact that raw sewage deposited in a stream or lake by a municipality is usually at a safe distance from the water supply of the municipality constructing it and also in such a manner as to prevent a local nuisance. No regard is paid to the health and convenience and happiness of others, and frequently a water supply of an individual household or community is contaminated and nuisances and dangers of a far reaching character are created.

Instances of this kind are happening from time to time. This Board may direct their abatement, but there the matter ends, although lives are lost, health is endangered and nuisances continue to exist.

The remedy must be sought for in some more stringent legislation with heavy and daily increasing fines for their continuance after notice has been served upon the head of the municipality for the discontinuance of the same from this Board.

Water Supplies. I wish to sound a note of warning to municipal authorities in respect to the doubtful quality of many of the public water supplies of this province. Potability is of primary importance and the public require that every public supply should be at all times free from suspicion. The cry to-day is for pure food—so the demand must be for *guaranteed pure water.* This will require in many instances the adoption of a method of filtration somewhat costly it is true, but not prohibitive and none too good for the preservation of health and the prevention of disease. Personally I know of but few public water supplies in this province that are above suspicion as to their constancy as potable waters.

Next to quality comes quantity. How many cities and towns in Ontario to-day have any adequate supply at all seasons of the year for both domestic, manufacturing and fire purposes? The answer had better be given by the authorities themselves after careful consideration and the true facts not withheld from the interested public. My investigations lead me to think there will be many cases of shortage, although this statement may seem strange when we remember this province abounds in rivers and lakes.

Consumption. A statement made by a speaker at the recent formal opening of The King Edward VII. Sanatorium at Weston is my only excuse for again referring to this important question and pointing out the necessity for a stronger effort being made by county and city authorities in making early and adequate provision for the care locally of cases of this disease—either by dispensary with nurses, day camp rest, sanatoria or homes for advanced cases as the means of the authorities will permit.

What has been done in the province, chiefly through charity, has been entirely inadequate to cope with a disease which numbers amongst its victims over 2,500 persons annually of both sexes and of all ages. The efforts have but reached the outer edge of the work, but the results obtained have been such as to encourage to greater deeds. This one method has done good both along the educational and curative lines, but it is not the only method. Municipal authorities must enter into the work and by the adoption locally of one or more of the methods suggested help it on. To be successful it must be general throughout the length and breadth of the province, and should be conducted under medical advice and possibly the supervision of the present constituted health authorities.

As to cost, it is impossible to hope for a suppression of the disease without the expenditure of large sums of money, and the wild statement that a provincial contribution of $50,000 for a period of twenty years to any one institution would result in its total suppression is but to over estimate the powers of the present methods and to underestimate the subtleties of the white plague itself. Indeed the cost of the warfare is the one great difficulty that confronts the work against the disease in all parts of the world and is perhaps the chief factor in forcing those interested to the conclusion that governments, municipalities, insurance and benefit companies, churches and charity must all be brought into line to assist in the movement before great results along the line of prevention can be looked for.

Minor Complaints. The great increase during the past two or three years in the number of complaints reaching the office respecting nuisances in both rural and urban municipalities often accompanied with the proof that the local health authorities have failed in their duty either to consider the complaint in the manner set forth in sections 67-72 of the Public Health Act, or else after consideration decline to pronounce thereon and direct the action to be taken—are indications of the incompetency which I fear too often exists on the part of local boards of health to enforce the Health Act locally.

The trend of the present day is to load the work upon the provincial office. Under the present Act local authorities have the right to administer the same and only in the special instances as set forth in the Act can these matters referred to be dealt with by this Board.

In every instance where it is found the Act has not been complied with the matter is referred back for local consideration. I cannot but express the thought that in many instances difficulties would be overcome and nuisances abated much more effectively and promptly if provincial officers were employed, but in this respect as in many others the functions of the Provincial Officer are more consultative than authoritative, a fact which in the public mind is too often lost sight of, and as a consequence the actions of the Board and its officers are misjudged and unnecessarily censured by the public.

Scarlet Fever and Diphtheria Regulations. These regulations were formulated by the Provincial Board of Health and approved of by an Order-in-Council, dated March 5th, 1903.

The occasion for them was the appearance of both diseases throughout the province in a more or less epidemic form. Some doubts were expressed at the time that in some particulars they were apparently contrary to the provisions of section 93 of the Public Health Act. Their issuance was undoubtedly of much service in preventing the spread of both the diseases, but with the subsidence of them in epidemic form the question was frequently asked were they to govern the actions of health officers or were these officers to take as a guide the statutes.

The Medical Health Officer of the City of Brantford, Dr. Pearson, has honestly endeavored to enforce the regulations by removing all cases to the hospital. Recently, however, upon his endeavoring to remove the child of one of the prominent residents he met with opposition which resulted in his laying information against the father of the child who at the trial set forth the defence that by carefully isolating the child at home and placing it in charge of a trained nurse he was complying with the Act. The magistrate made an appeal to the Attorney-General before passing sentence, the following decision was given by the Attorney-General:—See appendix—and the case dismissed.

This decision of the Department virtually nullifies both of these regulations and leaves it free for health authorities to act under the provisions of section 93 of the Public Health Act.

Under these conditions I would suggest to the Board the necessity of compiling some practical rules which while serving as a guide to health authorities will not be in the nature of an Order-in-Council, but in harmony with the Act.

First Aid. The large number of accidents which occur from time to time, and particularly those of drowning, lead me to suggest that the public require to be educated along the lines of "First Aid"—and this Board might move in the matter by bringing the attention of school authorities and all local boards of health to the benefits to be derived by a systematic course of lectures upon first aid, which will include resuscitation of the drowned. The knowledge is readily imparted in some five or six short lectures and the cost is merely nominal, and as a preventive measure it may be said to be invaluable, often saving life and certainly preventing pain and suffering. Recent examples in the province only too loudly emphasize the need of just such knowledge widely imparted.

Reports of Medical Inspector.

R. W. BELL, M.D.

Report 1.—Smallpox.

During the quarter just closed I have only been called upon to deal with smallpox in four localities, although there have been reports of outbreaks in several more.

First. Kingston Penitentiary.—From here Warden Platt had reported a case, about which there was a conflict of opinion between Surgeon Phelan who diagnosed smallpox, and a city physician who had undertaken to look after the case for him.

The patient was a convict who went into the hospital ill on November 20th. Two days later a suspicious rash appeared, and two days afterwards was diagnosed as certain smallpox. The patient was at once removed to an isolated house on the penitentiary farm a half a mile distant, with a patient nurse and guard, and the hospital building thoroughly disinfected and exposed persons isolated.

The only source of origin suspected was from a coal schooner, where several convicts worked unloading, in contact with boat hands, although the patient did not work there, but in a room where these convicts changed their clothes, etc.

I visited the patient on November 28th and found him covered with a very characteristic rash in the vesiculo-pustular stage, and he had had typical prodromal symptoms. There was no mistaking the disease. Patient says he never was vaccinated.

Later, I advised with the warden and surgeon to vaccinate all exposed persons, in fact all convicts immediately on admission, and to take all other precautions at present as required by isolation, disinfecting, etc. With these precautions the outbreak was confined to this one case.

Second.—While in Pembroke on December 5th in connection with lumber camps etc., I learned that a case of smallpox had developed in town two days before, in a young women who had been clerking at a cheap sale the previous week, and therefore in contact with many people. She also lived in a rather congested part of the town. The M.H.O. told me he had on enquiry found there had been several cases in her neighborhood recently, and not yet scaled off. These had not been heard of before. No vaccination had been carried out, and no sanitary police appointed. The Board of Health appeared very lax, in fact I am justified in saying indifferent about the matter, as neighbours were expected to attend to the wants of these people, if they remained in quarantine, which was doubtful, as it was only a verbal request to stay in. This the Chairman of the Board of Health told me he thought was sufficient, as these parties were all known to the police and if seen down town would be sent home. I urged on both the M.H.O. and the Chairman of the Board of Health immediate vaccination and isolation of all exposed persons, and a close surveillance for possible further developments, also removal of the developed cases to an isolation hospital.

I was informed that there had been two cases shortly before at the convent, treated in an isolation building. Further information regarding these cases I am unable to give, as letters of enquiry remain unanswered.

Third. Township of Pickering.—Instructed to visit this township and see a suspected case, I did so on December 13th, and with Dr. Bateman visited Rosebank, and there saw a child three years of age with a rash which the doctor stated had been distinctly papular and vesicular, but both were scratched and burst. A complete history of the case convinced me it was smallpox, and not as thought "possibly urticaria papulosa."

The child had unfortunately been taken to several neighbors during the past week or two. Now isolation and quarantine were ordered and vaccination of all exposed persons. I called on the Secretary of the Board of Health and reported the case, and as there was no M.H.O. I instructed him to have the council at a meeting next day appoint one, also have Board of Health meet and take all necessary steps to stamp out the disease. Later information received from Dr. Bateman confirmed my diagnosis. I believe effective measures were here taken and the disease checked, with the development, however, of one more case from an entirely different source.

Fourth. Township of Vaughan.—A report having reached us that smallpox was prevalent in the vicinity of Kleinburg, etc., I visited that locality on December 29th, and found four cases, one in Kleinburg Village and three at Nashville two miles distant, all adults.

One of the Nashville cases came from Manitoba four weeks previously, with a developed rash, two weeks latter his father, aged 70, developed it, and a few days later his brother residing near by, and sister in Kleinburg, who all had visited him. All were quarantined and houses placarded under supervision of Dr. Robinson, M.H.O. No sanitary police had been appointed so the quarantine was far from being effective.

While here the sanitary inspector reported a case in Maple Village, seven miles east. I at once drove there and found a young man 19 years of age had developed a good rash on Christmas day. He had been teaching school near Aurora until the previous Friday, and was now isolated at his father's house, under care of Dr. Logan, but no vaccinating had been done, although a younger sister in the same house had never been vaccinated. The quarantine was not effective as his father was daily exercising his horse on the neighboring roads where there was much driving. I ordered this stopped, and visited the township clerk, and instructed him to have the council, which was to meet on Monday 31st, appoint sufficient sanitary police to guard the cases at Kleinburg, Nashville and here.

Report 2.—Smallpox.

During the past half year smallpox has been very prevalent in the older settled portions of the province, while the northern district or New Ontario has been almost exempt. Fortunately for the patients, it has been of a mild discrete type as a rule, although there have been numerous cases with very profuse rash. So far as reported there have only been two fatal cases, one in the Township of Stephen in the County of Huron, and one in Kemptville in the County of Grenville. Unfortunately the same old story has to be repeated, that in several instances it has been mistaken for chickenpox, etc., and the necessary precautions were not taken to prevent its spread. Most of these mistakes in diagnosis should not have been made, and in one or two cases, I have reason to believe the correct diagnosis was strongly suspected or absolutely known, but concealed and made light of for business purposes. In one case where the concealment was deliberate and the public safety greatly endangered, by instructions, I laid a complaint for neglecting to report the case against one of the leading physicians of the town, and the offender was convicted and fined.

The calls for me to visit localities where there were suspected cases, were numerous, to verify the diagnosis and advise *re* precautions to prevent the spread of the disease. The local Medical Health Officers and Boards of Health have all the power necessary to cope with the disease, but in many instances they are reluctant to, and feel as if they hardly dare to enforce the restrictions requisite to deal with it, without the immediate backing of the Provincial Board or one of its officials, because of personal, professional or business relationships. The mild type of the disease also renders more difficult the quarantining of patients and the exposed members of a household, as the patients being usually up and about and feeling pretty well, they do not see the necessity for isolation. In many cases no physician has been called in, or possibly there has been one visit in the prodromal stage, when it simulated an attack of la grippe. In one place where there had been a large number of cases mistaken for several weeks for chickenpox, some of the medical men did not like to reverse their original diagnosis, although nothing could be clearer, most of the cases being in adults and very typical, and several with hundreds of pustules. Here one of the physicians repeatedly told me, he never saw a case of smallpox, and he did not think this was smallpox, although he could not say what it was. As he had recently been appointed M.H.O. for the municipality he said, as I had diagnosed the cases as smallpox, he would treat them officially as such, and try and stamp out whatever the trouble was. In this same place one of the newspapers published a long editorial casting doubt on the diagnosis of smallpox, thereby lessening the precautions which might be taken by the general public, and went so far as to state in a separate article, that a death which had taken place was not from smallpox, notwithstanding the fact, that all the physicians—three of us—who had seen the case agreed it was such, and the cause of death had been registered as smallpox. With such opposition as this to contend with, it is difficult to prevent the spread of the disease. Of several hundred cases seen or directly enquired about by me, only four ever claimed to have been vaccinated. On two of them no vaccine scar was visible, and the other two had been done in infancy over 40 or 50 years before. In many families I found all the unvaccinated members had contracted the disease and the vaccinated members escaped, for example, in Township of Stephen, one family of ten, all unvaccinated, unless possibly the mother in infancy over 40 years ago, all had the disease; in the adjoining house were seven inmates, two unvaccinated had the disease and five vaccinated escaped; in still another house there were eleven persons, four unvaccinated contracted the disease and the seven vaccinated escaped. I could go on enumerating many more similar cases, but these are sufficient at present to shew the protective influence of vaccination.

Wherever I visited, I urged immediate vaccination of all exposed persons and in some instances general vaccination for whole municipality, effective quarantining, and finally the most thorough disinfecting of personal clothing, bedding and all household contents and premises. Many infected centres I could not visit, owing to inability to be in two places at the same time, and also owing to duties other than contagious diseases frequently requiring attention. It was rarely possible to trace the original case in any locality to its source as owing to the mild type of the disease, many convalescent cases and exposed persons with the germs in their clothing, are travelling about the province on railway trains, etc., quite unconcerned or indifferent to the welfare of others, and I might add frequently ignorant of their trouble or of being a menace to the public.

More in detail I may mention the various places visited.

Township of Vaughan, County of York.—On December 29th last, I visited Kleinburg and there found four cases, all adults, one over seventy years of age and a severe case. A member of this family had arrived home from Manitoba with the rash out on him about four weeks previously, and now three other members of the family, living in different houses have it. No effective quarantine was enforced.

The same day at Maple in the same township, I found another case, in a young man, a school teacher from near Aurora, who had come home eight days ago, and two days later developed a rash. No connection between this and the Klienburg cases and I could not trace the source. I instructed the authorities of the township to at once put on sanitary police at both Klienburg and Maple to enforce quarantine, as it was being quite disregarded. Learning five days later that the council here had deliberately decided to disregard the requirements of the Regulations and had not put on sanitary police, your secretary instructed me to return there and insist on immediate compliance, or if any further refusal, then to appoint as many as necessary and see them on duty on your behalf, and at the expense of the municipality. The following day, January 4th, I visited the township and before I returned the council had a sufficient number on duty.

Petrolia, County of Lambton.—On January 7th, I found one case here well isolated and every precaution being taken. The case had come from Oil Springs where the disease was prevalent under the name of chickenpox. On May 18th, I again visited Petrolia and Dr. McAlpine, M.H.O., reported there had been 17 cases during the recent epidemic. With him I visited their isolation building where were four cases, and also four private houses in which were six cases, three of these being new to him and not reported previously, making in all 20 cases.

Oil Springs, County of Lambton.—I arrived here on the evening of January 7th, and at a meeting of the council that night was informed there were cases in four houses and only recognized three days before. Dr. Chalmers was appointed M.H.O. at this meeting, and sanitary police appointed. I soon learned that the disease was quite prevalent and had been looked on as chickenpox for some weeks. With Dr. Chalmers I visited seven houses between 10 p.m. and midnight and saw 14 cases, one of these a young man a bartender who had had a very profuse rash, and had attended to his duties all along, as also assisted in an adjoining butcher shop a portion of each day, a most outrageous state of affairs. Next day I continued my investigation and saw six cases in four houses and heard of many others. One of these was a barber who had had a very heavy rash and had remained at home for 13 days, when he returned to work, with the crusts all over him. He told me he had "massaged" himself and on asking for an explanation he shewed me how he had rubbed the scabs off his arms, face, neck, etc., on to the floor of his shop, and then rubbed himself with a coarse towel, after which he went to work. He had evidently had hundreds of pustules on him as the brown spots were quite distinct, it only being two weeks since the "massaging" process.

I met with the Board of Health and School Board the same day and advised closing of churches and schools, and prevention of all public gatherings, also that a proclamation be issued for general vaccination, and that more sanitary police be put on, and no one be allowed to leave town unless vaccinated and able to secure a certificate of non-exposure. This certificate they declared they did not think any resident of the village could secure, as probably everybody had been more or less exposed. I advised a house to house visitation to find out all cases. I also advised the disinfection of all mail matter before being sent out from the post office.

On my return home your Secretary communicated my suggestions to the Michigan Central Railway authorities and to the P.O. Department, Ottawa. Dr. Watts was also sent up to take control of the situation, and remained for three or four weeks until the disease was well under control and nearly stamped out. This has been the most serious outbreak I have had to deal with.

Chatham, County of Kent.—On January 10th, I visited Chatham and found rather a serious state of affairs existed. Dr. Hall of your Board and M.H.O. of the city informed me that during the past year there had been cases every month except June, in all 94 cases. Of these there were in October, 14; November, 10; December, 30, or nearly a new case every day for this month. Up to date in January there had been 20 cases reported or two a day, an alarming increase. Two vaccinators had been appointed by the city, to vaccinate all whose consent could be obtained without expense except for vaccine.

Of the 94 cases last year, 65 were white people and 29 colored. 57 were treated at public expenes and 37 paid their own. About two-thirds were treated at home and the remainder in isolation tents, etc. The cases here have been traced to several different and unconnected sources. With Dr. McKeogh and Dr. Hall, I visited several cases, and one house where one member of the family had a well marked crop of pustules, another had just one well developed pock on her arm. I might here say I met a similar case about three months later, where a girl of about 14 years of age had just one well developed pustule, while her older sister and her father each had a good crop.

With Dr. Hall I met the Board of Health and new council in the afternoon and talked over the situation, and urged them to realize the alarming condition the disease was assuming and not to hesitate at the expenditure of any sum neccessary to stamp it out, and to give the M.H.O. full control, and be guided by his advice. Unfortunately at this time their Isolation Hospital had been flooded and the furnace put out of use, so they had to fall back on tents, in which there were a few patients.

East Tilbury, County of Kent.—While in Chatham on January 10th, Dr. Sharpe of Tilbury reported to me a case seen by him the day before in an adult—rash out a week— well quarantined, and looked after. The case traced to the Aberdeen Hotel in Chatham.

Township of Peel, County of Wellington.—Dr. Robinson of your Board having reported smallpox at Alma, I visited there on January 18th and with Dr. Norman Wallace saw several cases. One a merchant in Alma and seen by Dr. Robinson the previous day was still behind his counter attending to customers. He had a fairly good crop of rash out on all parts of the body. I insisted that he should at once retire to his rooms in the rear of the store where he lived and close it in the meantime, but an hour later I found him still in the store attending to customers, and only by using severe threats did I succeed in making him desist. The township had neither M.H.O. or sanitary police to enforce quarantine, etc. I drove across the township to Drayton visiting several cases on the way, seeing 14 and learning of 20. At Drayton in the evening I met the township council of Peel and also the Board of Health, when they appointed two M.H.O's and sanitary police, also decided to order compulsory vaccination, and for a time close churches and schools, etc.

Township of Maryborough. County of Wellington.—January 19th, I visited a case at Stirton with Drs. Flath and Munns, in an adult female. There had been a party at this house on January 12th, the day after the rash appeared and therefore many exposed, but all have since been vaccinated but one, and were under surveillance. Another very suspicious case was seen in Moorefield. Dr. Munns and the Board of Health with which I met were thoroughly alive to the requirements and prepared to deal vigorously with any further outbreak.

Townships of Toronto and Chinguacousy, County of Peel.—Here five cases were found on January 21st, and four of them I saw with Dr. Bowles, M.H.O. of Woodhill. The other at Sandhill near Mono was reported by Dr. Graham and all were well in hand. A case related to the ones near Woodhill was reported at Thistleton in York County. Some of these cases had been mistaken for chickenpox.

Town of Barrie, County of Simcoe.—A non-reported case having been brought to the attention of your Secretary, I was requested to investigate, which I did on January 24th. I found the Board of Health and M.H.O. were totally unaware of any case in the community. I however, found a well developed case in the pustular stage in the proprietor of a livery stable. He had been very ill for two or three days with the prodromata, but feeling better on appearance of the rash he had returned to work in his livery barn for two days, when he was advised by his physician to retire to his house and keep out of sight. His business went on as usual and the case was not reported. I at once notified the Local Board of Health, and immediate steps were taken to prevent further spread of the disease.

As before mentioned, I, on January 30th, prosecuted the delinquent physician for not reporting the case, and he pleading guilty, was convicted and fined.

Township of Sandwich West, County of Essex.—On February 1st, I visited this township, and with Dr. Beasley of Sandwich, saw 18 cases in four houses at Sunniside along the line of the Windsor and Amherstburg Electric Railway. Dr. Beasley had accidentally discovered these cases when called for some other trouble, as no physician had been in attendance. The first case was traced to the Aberdeen Hotel in Chatham, where the daughter of one of these people had been visiting shortly before Xmas. There is much traffic over the electric car line from this neighborhood, but as there were many exposed persons here, and an utter indifference was shewn to the necessity for quarantine, we arranged with the railway people not to stop or pick up passengers at this point. Next day I met with the council, and had to insist on *an immediate* appointment of a M. H. O. and sanitary police to enforce quarantine, which was much needed.

Cobalt, District of Nipissing.—On March 6th I visited Cobalt and found four cases of smallpox in a pest house. They were in crust stage and one in pustular. Two of these cases came from the Columbus mine, 5 miles out, and two devloped in a local boarding house, where a man from the Columbus mine who was sent back there with smallpox, had stayed for four or five days. These cases were well in hand and precautions taken to prevent further spread. Next day another case developed in the person of the wife of the above mentioned boarding house keeper. Next day March 7th, I drove out to the Columbus Mine. I found it had been quarantined 16 days, I do not think long enough. The quarantine had been raised last week and the patients had left the camp. The necessary disinfection of clothing and premises had been carried out by direction of Dr. Hair, M.H.O., I urged more attention to vaccination and greater vigilance with more effective quarantine. Another case or two developed in Cobalt but the disease was soon stamped out.

Townships of Stephen and Hay, County of Huron.—On April 15th, Mr. Eilber, M.P.P., reported smallpox in those townships. I at once hastened there, and on reaching Crediton that evening I met with Dr. McCue, M.H.O. for Stephen and the Board of Health, and advised *re* precautions to be taken. One death from a confluent case occurred that evening. During the next two days in the Village of Dashwood and adjoining townships of Stephen and Hay, I saw 54 cases in various stages, some with very profuse rash. These cases were visited with Dr. McCue of Crediton, M. H.O.

for Hay. The disease had been existent for several weeks, and mistaken for chickenpox, few of the cases having been seen by any physician. So far as I could learn, only one of these patients had ever been vaccinated, and that many years before. Vigorous measures being taken the epidemic was soon well in hand and stamped out.

St. Thomas, County of Elgin.—The sheriff having reported a case of smallpox in the gaol at St. Thomas, I proceeded there on April 22nd (Monday). The previous week six prisoners had been sent from this gaol to the Central Prison and one to the Asylum for Insane at London. These had all been isolated immediately on notification on Saturday. The assizes was open in the adjoining court house the day I visited the gaol, but there were no prisoners fortunately for trial. All in had been previously sentenced. The court house was well cut off from the infected gaol. One prisoner and one turnkey who had been exposed were quarantined in the gaol. The patient, an Indian in for 20 days for drunkenness, and time up the day of my visit, had been sent two days previously to the Indian Reserve at Muncey, as Dr. Mitchell there in charge of several cases, offered to take any Indian down with smallpox. This patient all the previous week, had been in contact with several prisoners and had been handling much bedding; however, I found all had been thoroughly fumigated and washed, and the gaol freshly painted. A lot of old mattresses which the patient had handled were to be burned, and the gaol get another scrub down and another coat of paint.

The following day I drove out to the Muncey Reserve, and found Dr. Mitchell in quarantine with 15 patients in the council house. He had had about 50 cases there during the past three months. These cases were under the care of the Dominion Government, but I urged every precaution to prevent contagion getting off the Reserve as complaints had reached me of Indians going freely into London and St. Thomas.

Township of Rochester, County of Essex.—On April 24th, I visited Ruscom and Woodslea in this township, with Dr. Kneister of Comber, M.H.O. for the township. Cases, undoubtedly smallpox, had been mistaken for measles, and not reported to him. There were cases also in the neighbourhood of St. Joachim and Belle River. The Board of Health did not appear to be dealing as vigorously as they should with the cases.

Town of Ingersoll, County of Oxford. I arrived in Ingersoll in evening of April 24th, and at 10 p.m. that night, with Dr. Colridge, mayor of the town, visited the Isolation Hospital (a small frame building erected a few days ago, and a marquee tent) and there found six cases, with Dr. Pratt in charge of the Isolation camp which was situated in the driving park. Next morning I visited a well developed case with Dr. Williams and again the isolation camp. Later in the forenoon I visited three families in the town with Dr. Neff, M. H. O., and found several more cases developing. All were to go to the Isolation Hospital. Everything here was well in hand, the municipal authorities and also the newspapers using all their influence to aid in arresting the spread of the disease.

Town of Smiths Falls, County of Lanark. On May 10th I visited Smiths Falls, and learned from Dr. Hagar, H. H. O., that there were five cases under treatment, one at home and four in isolation hospital. A proclamation for general vaccination had been issued, and the disease was well under control. It was claimed to have come from Kemptville about 20 miles east, where there was no quarantine and several cases.

Jasper or Irish Creek, County of Grenville. Jasper, in Township of Wolford, I visited on May 10th and found an adult daughter of the hotel keeper down in bed with a fairly good lot of rash out in the pustular stage, and being constantly visited by any and all guests and occupants of the house, not knowing the nature of the trouble. Her brother was just well over an attack and most crusts off, and he was attending the bar. Her mother was apparently developing an attack and papules were freely felt. A hired girl had recently recovered and gone home to an adjoining township. Many guests had been coming and going from the hotel, during the previous weeks, no doubt distributing the disease on all sides. Here the disease had not been diagnosed properly, and no precautions taken until the time of my visit, after which Dr. Anderson, M.H.O., took hold and with the aid of vaccination and rigid quarantine soon had it under control.

Kemptville, County of Grenville. May 11th, I visited Kemptville, and was informed by the M.H.O. that there was no smallpox in the village or neighborhood, but there had recently been a lot of chickenpox. After discussing the matter freely, I was convinced here was another situation where there had been mistaken diagnosis, on the part of all the physicians, although one doctor told me regarding his most recent case, that had it been his first one of the epidemic he would certainly have pronounced it smallpox, but as the previous cases were called chickenpox, he considered this one an aggravated case of the same. No cases were to be seen at this visit for me to form an opinion from personal inspection, but on May 25th I was called back and found several cases, about which there was not the slightest doubt. I now also learned of cases in the adjoining townships of South Gower in this same county, and of many previous cases in Township of Marlborough, in County of Carleton. I visited a number of these families and found the most positive and unmistakable evidence of smallpox which had been mistaken for chickenpox. I got the names of fourteen families where there had been patients with considerable rash and visited five of them. In some there were three to five adults and no children, all afflicted with the disease, some with hundreds of crusts or brown spots remaining. Dr. Blair at the other end of the township knew nothing of these cases, but as he was to be appointed M.H.O. in a day or two, I gave him a list, and urged a search for more, with advice to take immediate steps to disinfect all the infected houses, etc. I consulted with the authorities of all the adjoining townships and urged all precautionary measures to be taken. Later on, June 18th, I again visited Kemptville as the previous M.H.O. had resigned, feeling that he was not getting the support of the community in his efforts to control the disease. This was owing to the disinclination of a couple of the physicians to give up the chickenpox diagnosis, and to the newspaper articles casting doubts on the cases thereby rendering more difficult the steps necessary to stamp it out. However, another M.H.O. was appointed, and although he was one of the "doubting Thomas" he said he would "officially" treat the cases as smallpox.

Dr. Blair reported he had found several more cases in Marlborough, but had now all cleared up.

June 19th I communicated with Dr. Porter, of South Mountain, and Dr. Waddell, of Algonquin, in North Agusta, *re* cases under their care in these townships and found all being well looked after.

Osgoode, County of Carleton. June 19th I visited Osgoode Station and with Dr. Wallace saw several cases, but these he had well in hand, and was taking all requisite precautions to prevent further spread.

Township of Anderdon, County of Essex. On May 20th and 21st I visited the Township of Anderdon and saw twelve cases varying from the very mildest type to the most confluent, the latter a woman confined just one week previously. These cases were distributed over three concessions, and nine houses. There were others reported to me by the M.H.O., Dr. Stewart, of McGregor. Quarantine was very lax, only one sanitary police for the whole township None of these cases had been vaccinated. I found a proclamation ordering vaccination had been issued on May 8th and stating that the M.H.O. would visit from house to house forthwith to carry out the order, but at the date of my visit no one had been vaccinated. The M.H.O. said he had not been furnished with vaccine, and the reeve told me as an excuse for the laxity, that he believed none was to be had. This was absurd, so I insisted that they get to work at once and use more vigoruos measures to control the spread of the disease.

Village of Athens, Townships of Bastard and Kitely, County of Leeds. Reports having reached your secretary that smallpox existed at Athens, and that cases had developed in other places which were traced to that source, I visited Athens on June 6th and found there had been several well marked cases, and still one with very profuse rash. These had been called chickenpox so as not to alarm the citizens, and here, as in Oil Springs, a barber who had been covered with a very plentiful rash, and several members of his family similarly afflicted, had worked in his shop almost continuously, much to the alarm of many citizens who strongly suspected smallpox. There certainly had been gross blundering or neglect in this community, if not something worse—deliberate denial of the true state of affairs, until concealment no longer possible. After meeting with the Board of Health and physicians, more stringent measures were to be immediately taken to stamp out the disease.

Next day, June 7th, I drove to Frankville and found there had been cases in *Township of Kitley*, but here energetic measures had been adopted by Drs. Burns and Dixon, and the disease was quite under control. At *Chantry* there were several cases in at least three families, these in Township Bastard. I saw Dr. Cregan, M.H.O. for the township, at Delta, and also communicated with the reeve, and urged prompt means to be taken to stamp out the epidemic.

That evening at Athens I met with the council, Board of Health and school trustees, also the Board of Health, etc., of rear of Yonge and Escott and a lot of citizens and advised *re* course to be pursued in controlling the disease. None of the cases seen or reported in this neighborhood had ever been vaccinated and the majority were adults.

On June 8th I visited *Mallorytown* and with Dr. Lane, M. H. O., and Dr. Judson visited a family about three miles east, nearly all the members of which had recently had an attack, the mother still having a rash of a confluent type, but up and going about. The necessary precautions were to be taken at once.

Township of Edwardsburgh, County of Grenville, and Township of Matilda, County of Dundas. On the evening of June 8th I reached Cardinal and with Dr. Blakeman, M.H.O. of the village, drove out and saw cases in both these townships the same evening. On Monday, 10th, Dr. Blakeman very kindly gave up a good part of the day to driving me to several more cases in these townships. I met Dr. Harkness, of Irena, M.H.O. for Matilda, and also Dr. Saulter, of Spencerville, M.H.O. for Edwardsburgh, and advised with them *re* controlling the disease in their respective townships.

Town of North Bay. On Tuesday evening, July 23rd, a telegram from the Divisional Superintendent, C. P. R., at North Bay announced a case of smallpox discovered on one of their trains arriving there. I left at once to overlook the situation, and next morning I learned that the patient arrived at North Bay from Vancouver on Monday night in a colonist car. The case had not been suspected until near North Bay, when the conductor who took charge of the train at Chapleau telegraphed to North Bay to have the C. P. R. physician see the suspect on arrival, and the case was pronounced smallpox. The car was isolated on a siding and next day the patient removed to a tent on the lake shore, and the car disinfected. I saw the patient Wednesday with a well developed rash in pustular stage, and he admitted having much rash before leaving Vancouver, but did not know what it was. He came from a lumber camp, a short distance from Vancouver, where he had stayed over night at a hotel, and was on his way to his home in Dalhousie, N. B. He was detained in isolation camp at North Bay until recovered. I discovered that five passengers had occupied the car with him, and all had been allowed to escape before reaching North Bay, without trace being kept of them. Three of them, however, were Chinamen with tickets for Toronto, so I at once wired your secretary, and the Toronto health authorities being informed, a search for them was instituted and they were found in two days and quarantined. The other two held tickets for Montreal and St. John, N. B., respectively. I asked the C.P.R. authorities to wire these places, but as we had no definite description of the parties I fear they were lost track of. The health authorities at Vancouver were wired *re* the hotel at which our patient had put up, and I also had the Dalhousie health officer wired to look out for the baggage (which had gone on) of our patient, as it would need disinfecting. Dr. McMurchy, of North Bay, was looking after the case. A portion of the expense in connection with this patient I fancy will have to be borne by your Board.

North Toronto. With Dr. Jeffs, M.H.O., on August 7th I visited a family in North Toronto, recently moved out of the city, and confirmed his diagnosis of smallpox. The patients were soon afterwords removed to an isolation tent and quarantined, the remainder of the family being vaccinated.

Village of Georgetown. At the urgent request of the M.H.O. I visited Georgetown August 23rd, and with Dr. McAndrew saw a patient, a young lady visitor in town from New York State, and confirmed his diagonsis of smallpox. This patient had been visiting previously in Hamilton and Guelph, and had been in Georgetown thirteen days when I saw her, but the rash had been out over a week. It was a modified case, and all symptoms were quite mild, including the prodromata. This was accounted for by vaccination about six years previously. This was the first case I have met with since connection with your Board, where a recently vaccinated person had contracted the disease. As a large number of persons had been exposed, the patient having been at church, and also a garden party a few days before, efforts were to be made to vaccinate as many as possible of those exposed.

Township of Woolwich, County of Waterloo. At the urgent solicitation of Dr. Lackner, M.P.P., for this constituency, I visited this township on Sept. 4th. I had previously conferred with the health authorities by telephone. I found four cases of smallpox at the brick yard, a short distance north of Elmira. They were of the ordinary mild type and as Dr. Robinson, M.H.O. of the township, had the cases well in hand, a sanitary police was in camp close by, there was nothing for me to do but confirm the diagnosis. These cases had been reported by Dr. Ratz, of Elmira, who had first discovered them. The source of the trouble was supposed to be Berlin, where two weeks before the attack broke out here, members of one of the households had been visiting a family *said to have* chickenpox.

This brings me to the end of the cases with which I had to deal directly, but while in Sarnia in May, I learned there had been 17 cases there since Jan. 1st, and in Windsor there was a case or two at the same date, but I did not see them. The disease has been very prevalent in many other places, particularly the Bruce Peninsula, which was visited by Dr. Murray for several weeks.

Report 3.—Lumber Camps.

It will be remembered that prior to September, 1906, the "Regulations for Sanitary Control of Camps in Unorganized Districts" required all employers of labor therein to contract with a physician for the inspection of the camps, and also for medical and surgical attendance, etc., on the employees, the employer providing hospital accommodation and maintenance, while he was authorized to deduct from the men's wages a sum not less than 50 cents nor more than $1.00 per month to be paid to the physician for attendance and medicine, etc.

Many of the lumbermen complained that this regulation was burdensome and interfered with the procuring of labor, especially in the eastern portion of the Province, much of the help being got from the Province of Quebec, where no fees are deducted from wages. In the eastern section the lowest fee of fifty cents was deducted, a little further west 60 cents. and in the Lake Superior region 75 cents, and about Lake of the Woods $1.00 per month.

There was very little complaint west of the Sudbury district. Even there and east the employers admitted that the Regulation was a good one, but because of the objection on the part of the men they unitedly asked for a change. I might here say that on consulting with many of the men, I found the objection was not so much to the monthly fee deducted, (as where most complaint it was only 50 cents) but because of not getting the expected medical attendance, and also because the whole fee was not paid in many instances, as provided by the Regulations to the doctor, but a percentage of it retained by the employer, to cover ostensibly other expenses incurred by him, and this was acceded to by many of the physicians under pressure of competition, even to the extent of 50 per cent. as the contracts were awarded to those who would accept the smallest fee. The result was unsatisfactory attendance on the part of the contracting physician, then the lumbermen blamed the doctor largely for the dissatisfaction amongst the men. One physician remarked to me "if employers will only pay us half the lowest fee we are entitled to, they can only expect half the attendance in return." However as a result of the request of the lumbermen, after due consultation between their representative, and your Secretary with the Minister and his assistant, a new set of Regulations were drawn up and sanctioned by Order-in-Council in September last. In these the minimum fee of 50 cents per month was struck out, and also the compulsory contract for medical attendance on the employees, *so far as lumber camps* were concerned, but the former system was optional if so desired, with deduction of a monthly fee not to exceed $1.00, otherwise there must be a contract for monthly inspection of camp at employer's expense, together with an incurred liability for surgical or medical attendance in case of accident or sickness, originating in camp. This appeared satisfactory to the representatives of the lumbermen at the time of its adoption, but I have found during the past season, that most of the employers state that they prefer the former regulation, and many of them contracted as formerly, but, in several instances paid the medical fees themselves. This had been done in a few cases prior to the change, and probably had a good deal to do with the difficulty of other firms in securing men.

If there had been no underbidding for men, between the employers, by offering to pay the medical fees themselves, and all had acted alike in the deductions, there would have been no loss of men on that score. One prominent employer said to me, "I never kicked against the old Regulations. The lumbermen got rattled when the good times came, and we could not get men. It was not the doctor's fault at all. The men blamed them were bluffing.''

I believe most of the lumbermen will continue the former contract system, as they admit it is just and fair, but they must all treat their men alike and cease what may be called unfair competition, or difficulties will arise, which it is to be hoped they will not try to saddle on the Regulations again, as was certainly done unjustly in the past.

During the past season the sanitary condition of most of the camps has been very good, and there has been very little illness, except in the early part of the season, when typhoid fever was very prevalent along the north shore of Georgian Bay and Lake Huron, many cases developing in the camps soon after the men went in, shewing the disease had been contracted before reaching camp. These men worked for a few days, and I believe polluted many of the ponds and water holes from which the men drink during the day when at work, and so spread the disease to an alarming extent. The hospitals in the "Soo,'' Thessalon, Blind River, and Sudbury were crowded with typhoid cases, many from the lumber camps, from September to November, but by the end of the year it had well died out.

So far as I know the camps have been entirely free from smallpox, which has been prevalent in the older sections of the Province.

Dr. Watts, as you are aware, was employed as Assistant Inspector for six months, most of which time he spent in New Ontario looking after the sanitary condition of the camps and enforcing the Regulations connected therewith, occasionally having to resort to legal proceedings to enforce them, owing sometimes to the negligence and sometimes to the persistent stubborness of those he had to deal with. It is to be hoped these severe measures will not have to be resorted to again. However, it has only been where there has been persistent ignoring of, or deliberate refusal to obey the Regulations that the arm of the law has been called into requisition.

While there are a few employing firms who promptly and cheerfully comply with the regulations, and say they find it no hardship to do so,—and the assistance of these employers we appreciate,—there are a large number who are rather slow and dilatory especially in making their medical contract, apparently hoping to escape a month or two expense, and there are still a few who deliberately try to evade the Regulations, for some unaccountable reason for the whole season, these two latter classes causing us a needless amount of worry and correspondence, as well as considerable expense and unnecssary travelling for your Inspector to compel compliance.

The extent of the lumbering operations in Northern Ontario is something enormous, but I cannot give figures this year as Dr. Watts attended to most of the northern camps, however, I might illustrate by stating that on the waters of the Blind and Mississaga Rivers alone there were 44 camps employing over 3,000 men.

I visited the Ottawa Valley, the Nipissing and Parry Sound Districts, and in the latter, during one trip in the latter part of February, I drove in three days 154 miles, and inspected eleven camps, making full notes in regard to location of camp, size of buildings, distance apart, number of occupants in each, air space, ventilation, source of water supply, drainage, disposal of refuse and garbage, location of closets, with sketch of each camp, and took several photographs to enable you the better to understand the conditions surrounding them. During the third day of this trip the thermometer registered 42 degrees below zero.

All of these camps with two exceptions were good, and one known as "Stone's Camp No. 3,'' belonging to Graves Bigwood and Co., was a model, the finest camp I have ever visited. Of the two to be condemned, one had a stable built right on the bank of a creek about fifty yards above the kitchen and the water supply, the other was a small jobber camp of about 20 men and without the slighest attempt at ventilation, and was absolutely dirty and foul smelling. Both these were to be remedied at once.

I have reason to hope that next season will see a decided improvement in the carrying out of the Regulations, and I am sure the lumbermen will soon realize that your Board does not wish to impose any hardship upon them, but to aid and assist in the betterment of the health of their employees.

Report 4.—Typhoid Fever in Napanee.

On August 1st, inst. by direction of your secretary, I visited the Town of Napanee, to report on a recent outbreak of Typhoid Fever.

I learned that since the last week in June there have been 40 cases, and that 21 of the first 25 cases had used water from the same well, which has since been closed. I was driven over the town by the Medical Health Officer Dr. Cowan, Dr. Stratton, and other members of the Board of Health, and had the water and sewage systems pointed out to me. After seeing these and getting some further information regarding water supply, it was not difficult to locate the source of the trouble, although there may be other contributing causes.

The main supply of water for drinking and culinary purposes is derived from shallow wells, 10 or 12 feet deep, receiving the surface water and the drainage or soakage from shallow sewers or rather loose stone drains into which were discharging numerous water closets. These drains are on several residential streets and are nothing more than elongated cesspools, as there is very little flow from them as they extend to the river. They were originally intended only for surface drainage, but unfortunately permission has been given for closet connection. Only after rain storms do they discharge freely at several points into the river, while in the interval the contents soaks through the bottoms and sides and pollutes the wells. In one or two instances the drains are partly tile and partly loose stone, and one portion not being large enough to carry off the flow from the other after heavy rain, there is an overflow much to the inconvenience and annoyance of several sufferers, the stench creating a great nuisance as well as health being endangered.

This contamination of the domestic water supply I am sure accounts for the epidemic. However, I may add that there is a public supply of water said not to be used for domestic purposes, beyond washing, etc., but this supply is also contaminated. It is taken from above the Fall towards the upper end of the town, and conveyed through a flume built up with loose stone on its sides to the pump house. On its way it receives a large amount of soakage from houses, etc., on its upper side, and also some private drains above the Falls. This water was admittedly not fit for use, but as it looks clear coming from the taps, the probability is that it is occasionally used for drinking or culinary purposes.

This supply is moreover further polluted occasionally in the event of fire, when the water is pumped directly from the river in the vicinity of some of the sewer outlets. I myself saw floaters and paper from closets around the outlet of one of the sewers in the centre of the town. As there is scarcely any perceptible current in the river, it becomes little more than an open cesspool. There is said to be a tidal flow up stream daily, increased very much at times by the wind, raising the water I was told sometimes two feet and carrying the sewage up almost to the Fall, and past the intake for fire purposes, and this vile water is what is then freely used to quench fires and saturate all the surroundings. It is only a wonder the town has escaped a fatal epidemic as long as it has. However, this is not all, no less than three cow byres are allowed to exist in town for 20 or more head of of cattle each, one of them in the very centre of the town where there is much filth and soakage, and also hog pens owned by the G. T. Railway, within a few yards of the station and close enough to be a nuisance to many citizens, which are occupied by hundreds of hogs every day or two for several hours, this being one of the leading shipping centres in Ontario.

Before leaving town I met with the Board of Health, and advised that the connections of w. c's. with the present drains—I cannot call them sewers—be abolished, also all pit closets be abolished and prohibited as it is impossible to prevent contamination of the wells from them; that a system of dry earth closets be established with public scavenging; that the present piecemeal method of building drains cease, and that an extensive plan for sewerage, modern and up-to-date to cover the whole town be adopted, and then proceeded with as rapidly as possible or the finances of the town will permit; that the nuisances mentioned be removed from the town. I also urged that another source of water be sought for, where a pure and uncontaminated public supply can be obtained, and the temptation to use present water will be removed, and also because the shallow wells now in use are a source of danger under any circumstances in a populated town.

I hope I have not spoken too strongly regarding the conditions I found, but what might have been considered sufficient for a rural village 40 or 50 years ago, is absolutely out of the question for a modern town of the present day.

Report 5.—Typhoid Fever at Cardinal.

An epidemic of Typhoid Fever having been reported from Cardinal, and an official request from the Council for an investigation having been received. I was requested by your secretary to visit the village, which I did on March 16th, inst. With Dr. Blakeman, M.H.O., and Mr. Benson, manager of the starch works which furnishes the water supply, I looked over the situation. Dr. Blakeman says, there have been 17 cases since the middle of January, he himself taking ill on January 25th and only returning from hospital on 12th inst. The other resident physician in the village, Dr. Locke, took ill on February 16th, and was still in hospital. Meantime the medical practice was being looked after by a *locum tenens*, a young physician, strange to the local surroundings. Three new cases had developed during the past week. Dr. Blakeman only knew of one case of typhoid in Cardinal during the past two and a half years he has resided there. The 17 recent cases are about equally divided between adults and children, and distributed all over the village. Their milk suppply is derived from eleven different sources, only three getting it from a general dairy. Three cases developed among parties who attended an oyster supper on January 7th, which was mentioned as a possible source, but I learned that only two of these ate raw oysters, while many others who have not developed the disease ate them freely.

All are using, I found, a common water supply, pumped from the St. Lawrence river. I was told there was only one well in use in the village, and none of the cases used its water. There is no sewerage system, and pit closets are in general use. The water supply is pumped to an elevated tank, from the rapids outside of the old canal, where there is a current of about 6 miles an hour, and it passes through a mechanical filter and is treated with alum, etc., before it reaches the tank which supplies the village by gravitation. This tank holds 100,000 gallons but as the starch works uses several hundred thousand gallons daily its contents are being constantly changed. On January 22nd the intake became choked up with "frazil" or "anchor ice" and then the suppply was pumped from the old canal, and so continued until February 12th, since which time it has again been taken from the rapids.

An investigation shows numerous 'pit closets" or "cesspools" receiving discharges from sinks and closets along the bank of the old canal into which the soakage must find its way. The closets of the public school stand on the edge of a natural creek or drain which discharges into the canal a few yards below, and a short distance above where the water was taken from. Almost directly across the street (north) from the school lives a family, one of the first to develop the disease, and the drainage from their closet certainly reached the above mentioned drain. Other cases also drained into it. This I consider has been the origin of several of the cases. Where the first case came from is doubtful, but others I am convinced were contracted from the old canal water supply, and the most recent ones from direct contact with persons or articles contaminated by previous cases, as there does not seem to have been sufficient precaution taken to prevent all possibility of spread in this way, both local physicians being absent themselves ill, and only a young overworked stranger in charge.

The Engineer at the pump house says the intake in the current is always liable to be choked by "fazil," and then the old canal has to be drawn upon, but it did not occur in 1905-06, but it did in 1904-05, as well as the past winter. He states, if the pipe was extended a short distance up stream into an eddy this would not occur. This extension, Mr. Benson says, he will make, but a Government W.C. on the point above must first be removed.

I have advised the boiling of all water before using, if any further cases develop, also to have samples of water taken from the river current, the eddy, canal, taps, drain and wells, etc , sent to the laboratory for examination.

I also advised against using the canal water under any circumstances: that the tank be thoroughly cleaned out immediately, (and this was promised to be done); that the plugs be taken out of the dead ends of the town pipes and they be flushed; that all pit closets be abolished and dry earth closets be substituted with a public scavenging system, until such time as an efficient sewerage system can be installed; abolish also all cesspools which may drain into the canal, and establish a sewer system as soon as possible. I think the carrying out of these suggestions will soon bring to an end the present epidemic.

Report 6.—Anthrax in Bracebridge.

Several cases of Anthrax having been reported from Bracebridge, with one death, supposed to have been caused by handling diseased hides in one of the tanneries there, I proceeded thither on July 4th, inst., to investigate, etc.

Wih Dr. Wales, M.H.O., I visited the tannery of the Anglo-American Leather Co., where all the men worked who had been affected with the disease. Mr. Schneider, manager, gave us all possible information, and shewed us all over the premises. I found that three employees had contracted the disease since May 18th viz., Wm. English, Obediah Stafford and Alfred Hillman. English took ill May 18th, was promptly operated on and recovered. Stafford took ill a few days later and died after a few days' illness. Hillman took ill about 20th or 21st June, and is likely to recover, his attack being in the forehead. English was attacked in the neck, and I understand Stafford the same and spread rapidly to the upper portion of the body.

Hides received in the early part of May were suspected of having caused the trouble, as English and Stafford were at the unloading of them in the large hide storehouse. One was opening bales and throwing the hides out of the car, while the other stood by and checked.

I learned, however, that about 10 or 12 men were engaged at the same work, and handling the same lot. Hillman was a loft foreman in the finshing room upstairs in the tannery, and never handled any of these hides at all. Rumour about the town said 30 or 40 men had left the tannery employment because of fear of the disease. Usually about 150 men are employed, but at the present time there are only 116. "Three men," Mr. Schneider said, "had left because of the present trouble, at least that was the reason they assigned, but there may have been more. Men are coming and going all the time."

Hides are received from Montevideo, in South America, and Rangoon and Karachi, in India—and generally come by way of New York or Boston.

In April 11 carloads of Montevideo dry stretched hides were received, and unloaded on April 25th and 30th. Rangoon hides are continually coming in, and are dry in bales, but not stretched like the Montevideo. Karachi hides are stretched and have very little hair on them. All are cured with chemicals, generally arsenic.

Hides are not landed at Boston, or New York unless accompanied by a certificate from loading point or where bought in regard to quality and freedom from disease.

These certificates I did not see, as Mr. Shaw, a member of the Company, told me they were retained by the Customs authorities, but not sure whether at the point of landing, or by Canadian customs officer at point of entry into Canada. He asserts that all hides bought by this Company are as 1st quality, but some seconds frequently among them, although all are certified free from disease.

Four cars of Karachi hides were received on May 4th and 7th, and unloaded in the storage shed on May 7th, 8th, and 10th. About one-third of this Karachi lot have been worked, and are in the liquor now. The remainder are in the hide house to be worked up as soon as required or men obtained. Tracing these four cars, I find they were not disinfected or cleaned, but three went out on May 11th and 15th, loaded with sole leather, two to Montreal and one to Toronto, while the other went to Shier's siding to be loaded with lumber.

In the process of tanning, these hides are washed and worked and an immense amount of filth from them is constantly being discharged into the river, as also a large quantity of sulphuric acid, about 60 large pailfuls per week being used in the vats in this tannery and being changed weekly, this quantity is discharged into the river, besides other chemicals.

If any of the hides are diseased and contain anthrax spores, these would be also discharged into the river to the great danger of the public.

There is another, as large, if not larger tannery a short distance farther down stream on the opposite side of the river, polluting the water in a similar manner and to the same or greater extent with the same risks.

I fear it is impossible to say from which lot of hides the anthrax was caused, if from any of them, as the infected men were handling many, and many other men were handling the same lots without ill result.

I believe the managers of these industries use every effort to secure only a good quality of hides and free from disease, but under any circumstances there is considerable risk run of an occasional diseased hide being amongst the others and escaping detection.

Report 7.—Typhoid Fever at Almonte.

Acting on the instructions from your Secretary, I visited Almonte on November 8th inst., to inquire into an outbreak of Typhoid Fever. With Dr. Hanley, M.H.O., Dr. Metcalf. Mayor, and Messrs. Little and Kirkland, chairman and secretary respectively of the Local Board of Health, I went over the whole situation. Since Oct. 10th there have been forty (40) cases reported and all but two have been from an area of about 100 x 50 yards immediately east of the C.P.R. station and a few yards west of the river. The other two cases are directly treaceable to this area. All come from 14 or 15 houses with from one to six cases, mostly adults, in each. Fortunately no deaths so far.

The house where six cases, is that of a liveryman, adjoining his stables and yard, wherein is a well to which I believe is traceable the whole trouble, as I was informed at least twenty-five of the infected patients used water from it. Others got milk from this family where no doubt vessels were washed by water from the well. On making further enquiries *re* milk I found the infected families got their supply from three different dairies and several private cows, and no cases were traceable through these sources except the one mentioned. Samples of water had been examined by Dr. Amyot from the different wells, two shewing colon bacilli, the liveryman's and Lowery's, and all yielding large quantities of chlorine varying from 12 to 93 parts per million, furnishing a good medium for cultivating bacilli. All the wells but two having shewn over 20 parts were "chained up," and use of water forbidden. However, I found that the liveryman had been given the key to his well and the water was being freely used for carriage washing, and was being scattered all over the yard, to soak into other adjoining wells, while the employees who were wet with this infected water were handling freely anything and everything about the house and premises.

All of these wells are about 30 feet deep, drilled through rock 25 or 26 feet, but the rock is full of crevices and very little soil over it. The whole infected area is rather low and flat with a slope to the river about 100 yards east. A swampy piece of ground or swail extends from near the infected section, south and a little west to beyond Wylie's Mill about a quarter of a mile distant. It receives considerable drainage and extends to the river at several points. The crevices in the rock may receive some of this soakage, also some from the neighborhood of the railway station as well as from the houses in the infected area.

I found also that the town carters were daily delivering many barrels of water to citizens, taken from the river at the bridge only a couple of hundred yards below the infected district, and very liable to pollution. The cases already developed were well in hand by the local physicians and very active measures were being taken to stamp out the disease by the Local Board of Health. An excellent leaflet with instructions how to act, and regarding necessary precautions to be taken had been prepared and distributed to the citizens, and all water ordered to be boiled.

I advised *permanent* closing of the two infected wells by filling with cement; that the others should be thoroughly cleaned out and further samples of water from them be examined and not used until a satisfactory report is received; also have water samples from the dairy farms and several indicated points in the river tested; stop supply of water from the bridge, and go for it above all possible source of town pollution, better across the river and above Wylie's Mill, and even there it will be found possibly none too good. I also advised the abolition of all pit closets in town, and the compulsory use of box closets with daily use of dry earth, and have a civic scavenger to regularly attend to these. These suggestions apparently met with approbation.

With Dr. Metcalf, I visited the vicinity of the new hospital, which is being erected, I understand, by one of the town's public spirited citizens. To receive the hospital sewage a few yards west of the building a cement tank in the ground is under construction. An overflow pipe will carry the liquid into a tile drain which discharges about 100 yards beyond into a natural public drain at a street crossing, and which from there to the river 100 yards further has stone wall sides. This is said to be dry in summer, and therefore the hospital sewage is liable to be deposited along its bottom and sides. This drain enters the river only 200 or 300 yards above the bridge on the east side of the river, and certainly is not advisable notwithstanding its proximity to the falls a short distance below.

Laboratory Report

BY JOHN A. AMYOT, M. B.

Presented at the Quarterly Meeting held Feb. 6th, 1907.

To the Provincial Board of Health of Ontario:

GENTLEMEN,—I have the honor to present you the following report of the work done in the Laboratory at Toronto during the quarter ending Dec. 31st, 1906.

Summary of specimens examined during the quarter ending Dec. 31st, 1906.

Municipalities 1906.	Diphtheretic swabs				Tuberculous Sputa		Typhoid Bloods		Miscellaneous Specimens	Waters		Total number for month
	Release		Diagnosis									
	+	−	+	−	+	−	+	−		Chemical	Bacterial	
October	15	23	28	32	33	66	103	124	30	14	260	728
November...	10	27	32	61	48	100	35	124	5	8	213	663
December...	16	12	15	41	31	64	33	51	36	4	79	382
	41	62	75	134	112	230	171	299	71	26	552	1,773
	103		209		342		470			578		
	312											

The work of the quarter has been chiefly of a routine nature, a consultation of the figures in the following tables will show that during 1906 the high-water mark of the work of the Laboratory was reached. Nearly 3,000 more specimens were examined than were examined during the previous year.

Summary of the specimens examined during the year ending Dec. 31st, 1906.

Municipalities 1906.	Diphtheretic Swabs				Tuberculous Sputa		Typhoid Bloods		Miscellaneous Specimens	Waters		Total number for month
	Release		Diagnosis									
	+	−	+	−	+	−	+	−		Chemical	Bacterial	
First quarter	77	70	112	168	146	372	96	141	45	22	376	1,625
Second "	63	60	452	592	178	406	60	178	159	45	345	2,532
Third "	107	68	501	509	171	273	189	256	94	38	568	2,776
Fourth "	41	62	75	134	112	230	171	299	71	26	552	1,773
Totals	288	260	1,140	1,403	607	1,281	516	874	369	131	1,841	8,706

Table showing the progress year by year in the demands upon work on the Laboratory.

Years.	Exudates suspected of being Diptheretic.	Sputa suspected of containing the Bacilli of Tuberculosis.	Blood specimens for the Widal Reaction of Typhoid Fever	Miscellaneous Sewage, Food Specimens, Milk Beverages.	Chemical Waters.	Bacterial Waters.	Totals.
1899....	375	629	164	57	29	116	1,370
1900....	526	703	221	25	33	194	1,669
1901....	1,018	1,006	405	98	38	215	2,780
1902....	666	1,056	415	593	65	206	3,005
1903....	851	1,153	513	87	231	291	3,126
1904....	1,444	1,447	812	191	59	628	4,586
1905....	1,281	1,870	662	810	41	811	5,787
1906....	3,091	1,888	1,390	369	131	1,811	8,706

Summary of reports sent to Dr. Bull, M. H. O., of E. Toronto, in connection with Typhoid outbreak there.

Date 1906	Laboratory Numbers	Where collected from.	Colon Bacilli	Chlorine in parts per million
Oct. 2......	6872	G. Scott's well......................	+	183
" 12......	7104	Old well	+	150
" 24......	7393	Well, W. W., New Tor................	+	254
" 29......	7458	T. Menzie P. Co........................	—	7
" 29......	7459	Z. Adam's well	+	105
" 30	7508	I..	+	275
" 30......	7509	II.......................................	—	223
" 30......	7510	III......................................	—	185
" 30......	7511	IV......................................	—	180
" 30	7512	V....	—	175
" 30......	7513	VI......................................	—	330
" 30......	7514	VII.....................................	+	285
" 30......	7515	VIII....................................	—	13
Nov. 7......	7750	J V. McAull...........................	+	107
" 7......	7751	L. J. West.............................	+	172
" 16......	7944	Starkan's.................	+	194
" 16......	7945	Bryan's.................................	+	80

The most noticeable feature of the above table is the large chlorine content of the waters in question. No. 7515 shows the nearest to the normal for the district, 8 per million. The geological formation all through the district is heavy clay or shale. Any chlorine soaking down from the surface cannot get far away. The wells naturally attract it in the surface.

No. 7458 is from Lake Ontario.

The Report of the Toronto Laboratory of the Provincial Board of Health for the Nine Months ending September 30, 1907.

*To the **Provincial** Board of Health of Ontario:*

Gentlemen,—I have the honor to present you the following report of the work done in your Laboratory at Toronto, during the nine months ending September 30th, 1907.

The following synoptic table shows the number of specimens examined during these quarters along with the chief heads under which these are placed.

Synopsis of Work done in the Toronto Laboratory of the Provincial Board of Health during the nine months ending September 30th, 1907.

Months.	Diptheretic Swabs.				Tuberculous Sputa.		Typhoid Bloods.		Miscellaneous Specimens.	Waters.		Total number for month.
	Release.		Diagnosis.									
	+	−	+	−	+	−	+	−		Chemical.	Bacterial.	
January	1	2	12	56	33	106	26	51	14	0	80	382
February	2	6	23	42	33	109	34	38	18	1	67	373
March	1	3	19	42	30	117	10	43	61	3	58	387
April	3	2	18	68	48	143	9	55	40	3	103	495
May	1	7	12	23	47	137	22	52	53	5	101	461
June	2	6	23	52	36	121	8	53	98	2	71	473
July	1	4	21	68	40	107	12	50	24	2	84	413
August	4	3	24	48	34	85	37	82	40	8	161	527
September	4	2	29	61	34	76	32	75	43	2	114	472
	19	35	182	460	335	1,001	190	499	391	26	839	3,984
	54		642		1,336		689			865		
	696											

Diphtheria exudates	696
Tuberculous sputa	1,336
Typhoid bloods	689
Miscellaneous specimens	391
Waters	865
Total	3,984

Remarks Arising out of the Preceding Tables.

1. It will be noticed that only 54 exudates were examined for disease from diphtheria quarantine. This is small and would seem to indicate that the municipalities are satisfied with the time quarantine, 28 days.

This 28 days was made on the result of some 18,000 examinations made in the State of Massachussetts, chiefly in Boston. They show that the average time of the disappearance of the bacilli from the throats of diphtheria cases is 28 days. But these examinations also showed that 20 per cent. of the cases still had living diphtheria bacilli in their throats on this 28th day, The patients were well but were sources of infection if let out. To check these, release by culture was instituted. It has its difficulties and its limitation but has done decided good. Then again it was shown that in many cases the patients were free of the bacilli, sometimes even in 15 days before the 28th. The release culture system would remove from those cases the hardship of being unnecesssarily held until the 28th day. No other comment would seem to be necessary.

2. The facilities of the laboratory are easily accessible and free. If I might be allowed to suggest, encouragement should be given to the larger municipalities to do as Toronto, Ottawa, Brantford, Belleville and St. Thomas are doing, namely, establish their own local laboratories for this work, or that more use of the central laboratories be made. This last could be facilitated if outfits were distributed for the collection of the samples instead of trusting to the devices of each sendor as at present.

3. During the month of June, the brain of a dog sent from Mount Brydges said to have died of rabies was examined. No details as to the situation surrounding the case were given. The head had been buried four or five days previous to sending. Negri bodies were distinctly made out and reported as one of rabies.

Subdural inoculations were made, but up to the present no symptoms have developed in the animals inoculated. The brain was either already sterile or the organisms so devitalized that the symptoms have been delayed perhaps to show at some later date. We have had one rabbit show symptoms after 160 days.

4. During the last three months the effluents from the sewage disposal plant at the east end of Toronto have been regularly analysed, but the data we are holding over to the end of the year.

5. For the License Department there have been analysed during this period, 59 alcohol or suspected alcoholic beverages—generally they were alcohol beyond the 2½ per cent. proof spirit.

6. For the Fisheries Department three sets of specimens to prove pollution of streams to the destruction of fish, were made. One at Brantford; one at Newmarket and one at Barrie.

7. In March nine samples of soaps submitted to the Charities Department in tenders for supplies were handed over to the laboratory to test their values as soaps.

8. Also during the period 46 patent medicines were analysed for their alcoholic content and for their active constituents.

As to these last items if it is considered expedient the results tabulated in these connections will be given with the final report of the year.

9. One hundred and sixty specimens of milk have been examined during the 3 quarters—with the exception of the 50 Toronto specimens—the rest were chiefly examined for butter-fat and perservatives. These last were only found some three times. On the whole the fat contents were above 3 per cent.

Table showing number of specimens under each denomination examined for each county in Ontario, during the months, January—September 1907, inclusive.

Municipalities.	Diphtheretic Swabs.				Tuberculous Sputa.		Typhoid Bloods.		Miscellaneous Specimens.	Waters.		Total number for month.
	Release.		Diagnosis.									
	+	−	+	−	+	−	+	−		Chemical.	Bacterial.	
Algoma	1				4	17	5	5	10		71	113
Addington											8	8
Bruce	1	1		7	9	23	2	6	5		2	56
Brant						3			7		1	11
Bothwell									1			1
Carleton				1	3	5	8	19	2		35	73
Durham				8	8	26			3		8	53
Dufferin					4	11		2	3			20
Elgin					1	1			1		1	4
Essex		1		1	10	49	3	8			2	74
Frontenac										1		1
Grey	3	1	7	3	15	41	3	13	9		1	96
Glengarry					2	3					2	7
Grenville						1	1	1			7	10
Huron		1	3	6	4	20	4	13	1		7	59
Haliburton				4	3	6	2	6	1			22
Hastings					6	21	6	10	3		33	79
Haldimand			2	2	2	8		2				16
Halton					3	12		6	1		1	23
Kent		1			14	41	4	11	4		17	92
Leeds				1			1	1				3
Lanark		1	1	2	2	3	1				1	11
Lincoln	1		2	3	11	15	3	6			6	47
Lambton			2	9	19	27	1	12	1	1	2	74
Muskoka			3	12	3	11	4	4	4		11	52
Middlesex				4	9	10		3	6	11	28	71
Norfolk	1		3	5	2	19	2				15	47
Northumberland			2	3	6	20	2	6			7	46
Nipissing	4	1	22	15	3	12	2	9	8		10	86
Ontario			1	3	7	26	1	6			21	65
Oxford				5	22	45	8	22	3		6	111
Perth			1	5	5	20	2	5	20		19	77
Prescott							1	3			2	6
Peterborough			2	5	6	21	11	13	68		11	137
Peel			1	2	5	8		2			7	25
P. Edward			1	2		5	2	1				11
Parry Sound			4	18	1	20	1	6	2		21	73
Rainy River			1	5		1		2			1	10
Russell					2	1						3
Renfrew				3	5	20	2	4	6		26	66
Stormont					2	6						8
Simcoe	3	4	14	16	18	74	11	20	8	2	11	181
Thunder Bay				6	2	2		1	8		10	29
Victoria			1	3	6	8	3	5		2	14	42
Wentworth			18	22	1	5	2	3	1	1	19	72
Welland			4	21	6	11	4	17			33	96
Waterloo	2	9	16	23	12	49	3	7	3		14	138
Wellington	3	4	11	24	10	30	4	25	4	7	14	136
York		6	57	200	66	224	78	208	172		277	1288
	19	30	179	449	320	981	187	493	365	25	782	3830
	677				1,301		680		365	807		3830

Laboratory Report,

By Dr. W. T. CONNELL, Assistant Bacteriologist Provincial Board of Health, Kingston Branch,

For the Six Months endmg December 31st, 1906.

Report from Laboratory of Provincial Board of Health, Kingston Branch, for Quarter ending Sept. 30th, 1907.

Municipalities.	Diphtheretic Swabs				Tuberculous Sputa.		Typhoid Bloods.		Miscellaneous Specimens.	Bacterial Waters.	Total Number for quarter.
	Release		Diagnosis.								
	+	-	+	-	+	-	+	-			
BRUCE CO.											
Paisley	......	......	......	3	......	1	......	......	......	......	4
CARLETON CO.											
Richmond	......	......	......	......	1	......	......	......	......	......	1
DUNDAS CO.											
Brinstons Cors.	......	......	......	......	......	2	......	......	......	......	2
Iroquois	......	......	......	......	......	......	......	......	......	3	3
Morrisburg	......	......	......	......	1	1	......	......	......	......	2
Winchester	......	......	......	......	1	1	......	......	......	......	2
DURHAM CO.											
Port Hope	......	......	......	......	......	1	......	......	......	......	1
ESSEX CO.											
Essex	......	......	......	......	......	2	2	......	......	......	4
FRONTENAC CO.											
Arden	......	......	......	......	......	......	......	......	......	1	1
Barriefield	......	......	......	......	......	......	......	......	......	4	4
Battersea	......	......	......	......	......	......	......	......	......	1	1
Bedford Mills	......	......	......	......	......	......	......	......	......	1	1
Harrowsmith	......	......	......	......	......	......	2	1	......	......	3
Kingston	......	......	1	13	20	49	16	18	19	6	142
Parham	......	......	......	1	1	1	1	1	......	......	5
Portsmouth	......	......	......	......	1	2	1	......	......	14	18
Sharbot Lake	......	......	1	3	1	2	1	1	......	......	9
Verona	......	......	......	1	......	1	......	......	......	......	2
Wolfe Island	......	......	......	......	......	......	......	5	......	......	5
GLENGARRY CO.											
Alexandria	......	......	......	......	......	......	......	......	......	2	2
Lancaster	......	......	......	......	......	1	......	......	......	......	1
Williamstown	......	......	......	......	2	2	......	......	......	......	4
GRENVILLE CO.											
Cardinal	......	......	......	......	......	......	......	1	......	......	1
Prescott	......	......	......	1	......	......	4	2	......	7	14
Spencerville	......	......	......	......	......	1	......	......	......	......	1
HASTINGS CO.											
Bancroft	......	......	......	......	......	......	......	1	......	......	1
Belleville	......	......	......	......	1	1	......	......	1	......	3
Marlbank	......	......	......	......	1	2	......	......	......	......	3
Maynooth	......	......	......	......	1	......	......	......	......	......	1
Roslin	......	......	......	......	......	2	......	2	......	......	4
Trenton	......	......	......	......	2	1	......	......	......	......	3
Tweed	......	......	......	......	2	2	......	......	......	......	4

KINGSTON.

Report from Laboratory of Provincial Board of Health for Quarter ending Sept. 30th, 1907.—*Continued.*

Municipalities.	Diphtheretic Swabs.				Tuberculous Sputa.		Typhoid Bloods.		Miscellaneous Specimens.	Bacterial Waters.	Total Number for quarter.
	Release.		Diagnosis.								
	+	-	+	-	+	-	+	-			
Lanark Co.											
Perth	......	......	1	1	......	......	......	1	......	......	3
Smith's Falls	......	......	1	......	1	2	3	1	2	......	10
Leeds Co.											
Brockville	......	......	......	......	2	......	......	2	......	2	6
Gananoque	......	......	......	......	1	3	1	1	......	......	6
Lansdowne	......	......	......	1	1	1	1	......	......	......	4
Mallorytown	......	......	......	1	......	......	......	......	......	......	1
Seeley's Bay	......	......	......	......	......	1	......	......	......	......	1
Westport	......	......	......	......	......	......	......	......	......	1	I
Lennox and Addington Co.											
Bath	......	......	......	......	2	......	......	......	......	......	2
Enterprise	......	......	......	......	......	......	......	......	1	......	1
Napanee	......	......	......	......	1	3	18	3	......	31	56
Newburgh	......	......	......	......	......	......	1	1	......	......	2
Odessa	......	......	......	......	1	1	......	2	......	......	4
Tamworth	......	......	......	......	......	1	......	......	......	......	1
Yarker	......	......	......	......	1	......	4	3	......	10	18
Northumberland Co.											
Campbellford	......	......	......	......	2	......	......	......	......	1	3
Roseneath	......	......	......	......	......	1	......	1	......	......	2
Parry Sound Co.											
Sundridge	......	......	......	......	......	1	......	......	......	......	1
Peterborough Co.											
Lakefield	......	......	......	1	......	......	......	......	......	......	1
Renfrew Co.											
Calabogie	......	......	......	......	......	......	1	1	......	......	2
Combermere	......	......	......	......	1	1	......	......	......	......	2
Arnprior	2	2	6	2	......	......	2	......	......	......	14
Pembroke	......	......	......	......	2	1	......	......	......	......	3
Renfrew	......	......	......	......	......	......	1	......	......	......	1
Russell Co.											
Metcalfe	......	......	......	......	......	2	......	......	1	......	3
Casselman	......	......	......	......	1	......	......	......	......	......	1
Simcoe Co.											
Barrie	......	......	......	......	......	......	......	1	......	......	1
Stormont Co.											
Avonmore	......	......	......	......	......	......	......	......	1	......	1
Bonville	......	......	......	......	......	......	......	......	......	1	1
Finch	......	......	......	......	......	......	......	......	......	6	6
Thunder Bay.											
Fort William	......	......	......	......	......	......	......	1	......	......	1
	2	2	10	28	51	93	59	50	25	91	411

KINGSTON.

Report from Laboratory of Provincial Board of Health for Quarter ending Dec. 31st, 1906.

Municipalities.	Diphtheretic Swabs.				Tuberculous Sputa.		Typhoid Bloods.		Miscellaneous Specimens.	Bacterial Waters.	Total Number for Quarter.
	Release.		Diagnosis.								
	+	-	+	-	+	-	+	-			
Bruce Co.											
Paisley				2				2			4
Carleton Co.											
Ottawa South				1							1
Dundas Co.											
Chesterville					1						1
Morrisburg						1					1
Winchester						2	1				3
Durham Co											
Port Hope					1	2					3
Essex Co.											
Essex						1	1				2
Frontenac Co.											
Barriefield									3	1	4
Cataraqui										6	6
Harrowsmith				1			1	3			5
Kingston	41	41	17	18	11	42	28	29	9	12	248
Parham			1	2	1						4
Portsmouth				1	1		1	7			10
Sharbot Lake					1	1					2
Wolfe Island								3			2
Glengarry Co.											
Dalhousie Mills						1					1
Williamstown						1					1
Grenville Co.											
Bishop's Mills							2	2			4
Burritt's Rapids						1		1			2
Kemptville										3	3
Prescott						2	1			2	5
Spencerville						3		2			5
Hastings Co.											
Bancroft			1			2					3
Belleville			2	1	1	6	4	5			19
Coe Hill				2							2
Madoc					1						1
Roslin						1					1
Shannonville						1	1				2
Stirling						2					2
Tweed					1	7			2		10
Kent Co.											
Chatham					1						1
Lambton Co.											
Watford								1			1
Lanark Co.											
Lanark						1					1
Pakenham						1				2	3
Smith's Falls					3			1			4

KINGSTON.

Report from Laboratory of Provincial Board of Health for Quarter ending Dec. 31st, 1906.—*Continued.*

Municipalities.	Diphtheretic Swabs. Release. +	Diphtheretic Swabs. Release. −	Diphtheretic Swabs. Diagnosis. +	Diphtheretic Swabs. Diagnosis. −	Tuberculous Sputa. +	Tuberculous Sputa. −	Typhoid Blood. +	Typhoid Blood. −	Miscellaneous Specimens.	Bacterial Water.	Total Number for Quarter.
LEEDS CO.											
Athens						2					2
Brockville						2	2	3			7
Gananoque					2	1		2		2	7
Frankville					1	3		1			5
Lansdowne					1	1					2
Lyn						2				3	5
Mallorytown				2							2
Seeley's Bay			1	1							2
Westport							2				2
LENNOX AND ADDINGTON CO.											
Bath			1		1		2			4	8
Enterprise	2	2				1					5
Napanee				3	3	1		1			8
Newburgh			1		1	2			1		5
Odessa					1		1				2
Tamworth						1					1
Yarker							1				1
NIPISSING CO.											
Verner										2	2
PARRY SOUND CO.											
Parry Sound					1	1			1		3
PRESCOTT CO.											
Alfred						1				3	4
RENFREW CO.											
Arnprior	1	8	2	3	1	2					17
Calabogie	7	5	6	1			1	2			22
Douglas				1	1						2
Killaloe Station								6			6
RUSSELL CO.											
Metcalfe				2		1					3
THUNDER BAY AND RAINY RIVER.											
Fort William							1				1
	51	56	32	41	36	99	50	71	16	40	492

Report of Board on Isolation Hospital Site for City of London,

As Provided for by Special Enactment of the Lrgislature, 1907.
Sec. 53, Chap. 23, 7 Edw. VII.

We are of the opinion the site is suitable provided that a portion of Waterloo street extending sixty-six feet west of the limit of the lot as shown in the said plan submitted, and being the easterly half of Waterloo Street from Ottaway Avenue to the river bank be included in said grounds for the use of said hospital and constituting part of said site, and provided that said site is enclosed by a suitable fence as will prevent access thereto on the part of the general public and communication between the inmates and employees of the General Hospital and Isolation Hospital buildings, and that this enclosure shall extend to the river bank immediately south of the hospital site and the said Isolation hospital be not placed nearer than thirty feet from the line of the adjacent street on the westerly limit.

We are further of the opinion that the same will afford ample space required to protect the public against possible danger of infection from the same when properly enclosed and operated.

This site includes a part of the hospital block, being 244x197½ feet more or less in area.

Note. The above resolution was unanimously adopted by the Board at a special meeting held at the City of London, July 16th, 1907.

Special Report *re* "Coal Oil Inlet" Nuisance,

Adopted by the Board May 20th, 1907.

That the Provincial Board of Health has made a careful and thorough inspection of Coal Oil Inlet in the City of Hamilton and the land, buildings and conditions adjacent thereto, and desire to state that in their opinion the accummulated conditions existing at the time of inspection constitutes a serious and dangerous nuisance, which conditions might be more specifically set forth as follows:—

(*a*) The cattle byers and piggeries owned and operated by George Stroud, Esq., occupied at the time of our inspection by a large number of cattle are without proper drainage and are so constructed and operated that the liquid filth from the cattle is retained for a lengthened time within the byers, which byers cause a foul smelling nuisance.

That enormous quantities of cow manure and liquid filth is drained and discharged from these byers into the head of the Inlet and permitted to lodge there, covering a large tract of saturated surface, further decomposing and emitting foul smelling noxious emanations, polluting the air to a large extent and affecting the employees of the adjacent factories and the occupants of other buildings and the citizens generally who require to frequent this locality.

That this in our judgment constitutes a serious nuisance dangerous to public health.

(*b*) That the Reduction and Fertilizing plant of Messrs. W. A. Freeman & Co., adjacent thereto, wherein is manufactured fertilizer from offal, dead animals and slaughter-house refuse, whilst in a fairly good condition of operation at the time of our visit is an establishment which in our judgment cannot be operated in the manner in which this is being operated and with the facilities at hand without constituting a serious and dangerous nuisance in such a locality.

That foul smells were caused by it at the time of our visit and emanated therefrom were perceptible at varying distances and directions subject to varying atmospheric conditions and wind influences.

That the exposure of hair to the weather and upon moist ground constituted an added unsanitary condition.

(*c*) We also inspected the adjacent sewage disposal works and deposition of sludge owned and operated by the Municipality of the City of Hamilton

We are of this opinion that such an accumulation of sludge as was permitted to lodge upon the bank of the Inlet at the time of our visit constituted a serious and dangerous nuisance emitting foul smelling and noxious odors.

That the sewage works themselves with the connected storm water overflow discharging into the waters of the Inlet constitutes a nuisance.

That the existing conditions evidently operated for some prolonged period in connection with the waters of the Inlet have so polluted the water and adjacent banks that these arms of the Inlet now constitute a nuisance

We therefore respectfully beg to report that these several nuisances be forthwith abated in the interest of public health and that the cattle byers and piggeries of George Stroud, Esq., be removed forthwith, and the land and deposits thereon so treated as to prevent their any longer being a nuisance.

We are of the opinion that the fertilizing plant above referred to should cease operations and the fertilizing material and other refuse at present thereon be removed, and the premises put in a proper sanitary condition.

That the Sewage Works at present in operation be so operated that they will no longer continue to be a nuisance, and that the sludge at present deposited, be properly covered so as to avoid further offence therefrom, and that further sludge be reguarly and periodically removed so as to avoid any accumulation thereof.

That the arms of the Inlet adjacent thereto be filled in so as to prevent offence and injury from the accumulated filth and stagnant water.

That the aggregation of the above mentioned conditions is in our opinion a very serious nuisance to a large number of citizens resident within a considerable area adjacent to the Inlet as evidenced by the affidavits submitted, and our personal observations of this locality confirms us in the opinion that these nuisances should be at once abated.

Chas. Sheard, M.D.,
Chairman.

Chas. A. Hodgetts, M.D.,
Secretary.

Dated Guelph, May 21st, 1907.

Information Required to be Furnished Annually to the Provincial Board of Health

By Proprietors of Lumber and other Camps in Unorganized Districts.

1. List of camps and location of each.

2. Name of foreman in each.

3. Means of access to each camp.

4. Average number of men in each camp.

5. Name and residence of physicians contracted with and whether located in camp or not.

6. Date of contract and its duration.

7. Whether contract is under Clause 2 only, or 2 and 3 of the Regulations, and if under the latter, state amount deducted from each man's pay monthly for physician's fee.

8. Is a permanent hospital provided in camp, or tent?

9. You are reminded that hospital tickets sold to employees in the camps are not recognized by this Board in lieu of the requirements of the Regulations.

10. Above information must be furnished immediately on the establishment of any camp later than Sept. 1st.

11. According to Clause 5 a copy of the Medical Contract properly dated and signed by both parties must be furnished this Board at the time of the making, and also a notification of any change in physicians or terms of contract.

12. Your attention is called to your responsibility under Clause 4, in the event of your only contracting for inspection of camps under Clause 2.

Engineer's Report on the Sewerage System of the Village of Bridgeburg.

By Geo. Ross, C.E., Welland, Ont.

Gentlemen,—During the month of October last, I received instructions to make a topographical survey of your village and prepare a report on a system of sewerage for the municipality, with plans and estimates.

I have made the necessary surveys, and have now the honour to submit the plans and estimates to you.

Periods of agitation, sometimes running into years, are often required in order to arouse sufficient interest to secure the adoption of a comprehensive and efficient system of sewerage, therefore I shall give a short review of some matters connected with this subject, and endeavor to treat them in such a manner as to aid your ratepayers in the consideration of this question, which is now of vital importance to your municipality.

Topography. The Village of Bridgeburg is situated on the western bank of the Niagara River, about a mile north of Lake Erie, and has a frontage of slightly over one mile on the river. The Corporation extends westerly from the river, a distance of from about a mile to a mile and one-eighth, and embraces within its boundaries an area of about seven hundred and twenty acres of land. Frenchman's Creek runs through the northwesterly corner of the Corporation, and it, with its tributaries, forms the natural outlet of a drainage area of about four hundred and seventy acres, or nearly two-thirds of the total area. The remaining area of about two hundred and fifty acres slopes easterly to the Niagara River, a large portion of it having a rather rapid fall towards the river; the width of this slope varies from about sixteen hundred to three thousand feet, and its summit has a height of about from thirty to fifty feet above the surface of the water in the river.

The relative elevations of the surface of the ground are shown by the contour lines on the plan accompanying this report. The elevation of the ordinary level of the water in the Niagara River, at the northeast corner of the village is taken as having an elevation of thirty feet, being the height shown above the datum line assumed for plotting the profiles, therefore the surface of the ground above the river, as shown by any of the contour lines on the plan, may be obtained in feet, by deducting 30 from the elevation marked on the various contour lines shown thereon.

The elevation of the Niagara River at Bridgeburg is about 572 feet above sea level, therefore if it is desired to refer the elevations given on the plan to a sea level datum, it would be necessary to add 542 feet to the elevations as marked on plan and profiles.

Drainage Areas. There are two main drainage areas, as already refered to, viz.: a westerly or northwesterly towards Frenchman's Creek, and an easterly towards the Niagara River.

There is also a general slope to the north, as may be seen by an examination of the profiles of Gzowski, Robinson and Crooks Streets. There are also a few minor watercourses, such as these emptying into the Niagara River; one a short distance north of Dufferin Street, and another about two hundred feet North of Gilmore Road, however they would have no effect on a scheme for a general sewerage system, except in so far as they might be used for carrying off surface water.

The most closely built up section of the village is situated on the northerly part of the easterly slope, and it is in this portion of the corporation that the need of sewers is more urgently felt. One sewer was constructed on Jarvis Street two or three years ago, and petitions were received for sewers on one or two other streets in the northeast part of the village, at a recent date, and in response thereto a report was prepared, according to which, the sewage from these streets would be run, by separate and independent outlets, into the Niagara River, without treatment, but this plan was not approved by the Provincial Board of Health, and I was then asked to prepare a comprehensive scheme for the sewerage of the residential portion of the municipality, by which the sewage could be brought to a common outlet.

The area naturally draining to Frenchman's Creek, though more extensive than the eastern slope of the village, contains large tracts of entirely unoccupied land, and the central portion of it is owned by the railway companies, much of it being taken up with tracks and sidings and used as yards, and not intended for a residential district.

The most westerly part of the Frenchman's Creek slope, that is built up, is on the north side of Phipps Street, but all these residences except two or three of the most westerly, can be sewered by the sewers leading to the river.

The Amigari section of the corporation is also in the area, naturally draining to Frenchman's Creek, but it can also be sewered by an outlet leading to the river.

As the main residential district lies on the Niagara River slope, and all portions of the Frenchman's Creek slope, that is intended for residential property, except a block of about forty-five acres at the northwest corner of the municipality, now vacant land, can be readily sewered, to a common outlet, emptying into the Niagara River, I have prepared the plans for such an outlet, which is to be located near the northeast corner of the corporation.

Population. The present population is about 1,500, or rather more than two persons to an acre, taking into consideration the total land area of the corporation, but if we leave out the central portion, occupied for railway purposes, and the northwest part of the village, which is not to be sewered to the common outlet into the Niagara River, there is left an area of about five hundred acres to a population of 1,500, being about three persons to an acre, but the system of sewerage to be adopted must serve for this area when it is wholly built up, and containing an average of from forty to fifty, or even one hundred persons to the acre.

Niagara River. The Niagara River is the outlet of Lake Erie, and flows northward thirty-four miles to Lake Ontario; the elevation of the surface of the river, and the fluctuations in its height, correspond with the elevation and fluctuations of the water level of Lake Erie, which would vary about two feet. In addition to the ordinary variation, in the height of the lake and river, owing to rainfall or melting snow, there is the difference in level caused by the action of the winds. A heavy northeast wind may cause the river to fall nearly two feet in a few hours, by forcing the water back up the lake, and a strong southwest wind by forcing the water down the lake and into the river, has the effect of raising the water in the vicinity of Bridgeburg about four feet.

The width of the river at Bridgeburg is about two thousand feet, the depth of the channel being from about eighteen to forty-eight feet, with a current of five or six miles an hour, but when the river is high the velocity of the water may attain a speed of not less than twelve miles an hour: the average flow of water is 222,000 cubic feet per second.

From Lake Erie to Chippawa, a distance of seventeen miles, the fall is about twelve feet.

Rock. From the International Bridge extending northward beyond the boundary of the corporation, a shale rock is exposed along the bank of the river, and on all streets lying between Courtwright Street and the Bowen Road, more or less rock will be encountered in sewer construction; near the river the rock is to be met with from two to four feet below the surface, and further west it is covered with from six to ten feet of earth, and at Crook's Street the rock is about thirteen feet below the surface.

Soil. The soil is mainly a heavy reddish clay, having a surface covering of loam.

Present Sewers. As far as I am aware, there is only one sewer in the corporation, that on Jarvis Street consisting of ten and twelve-inch pipe. Its length is somewhat over two thousand feet, and it is in good condition. It now empties directly into the Niagara River, but if a trunk sewer is constructed along Niagara Street, it will be necessary to take up the lower portion of this sewer, and relay it on such a grade that it will empty into the new trunk sewer to be constructed on along Niagara Street.

The Jarvis Street sewer is now used partly as a combined sewer, provision being made for carrying off the surface water from the street, by catch basins, or street gullies. Should you decide to adopt the separate system of sewerage in your municipality, these inlets for surface water can be done away with, and the sewer be converted into one for sanitary purposes only.

Why a sewerage system is required. One of the greatest advantages that any community can enjoy is an abundant supply of pure water, and such a supply having been obtained and distributed through the streets and houses, and employed for its various purposes, including domestic uses, washing, cleansing, and the gathering up of impurities, the question is what shall be done with it? It was distributed by a system of pipes decreasing in size as they branched out, and may be collected by another set of pipes increasing in size as the branches unite on their way to a common outlet, but the outgoing volume is very different from the incoming.

The incoming was pure and healthful, but the effluent has become fouled through the various uses to which it was applied, and may have taken up many germs, which if transferred to the human system, would produce disease and possibly death. Should this foul water accumulate and remain stagnant at any place, it would decompose and give off offensive odors. This fouled water is termed sewage, and the pipes by which it is collected, constitute the sewerage system. The means adopted to get rid of the collected matter, is termed sewage disposal. The pipes or conduits used for carrying off the water collected from the surfaces of streets and yards, together with roof water, during and after rains, and also for carrying off subsoil water, are called drains.

Where one set of pipes or conduits are used to carry off the fouled water, or sewage, and another set used to remove the surface and ground water, it is said that the separate system of sewerage is in use.

Where one set of pipes are used to carry off the surface water, or rainfall, as well as the sewage, the combined system of sewerage is said to be in use.

The distinct difference between sewers and drains should not be lost sight of, sewers proper being designed to carry off organic wastes from the human system, from the various cleansing processes common to households, and also manufacturing wastes, while drains convey rain or ground water only. The surface water from streets on which there is a considerable amount of travel, will gather up a certain percentage of organic wastes, but the impurities of surface water are not so apt to prove offensive or to become a menace to health, as those contained in sewage.

A sanitary system of sewers cannot be installed where no public water supply has been provided, but it is needed as soon as that is accomplished, for while the wells can be abandoned, the volume of waste water is very greatly increased by the waterworks system. Where there is a public water supply system without sewers, cesspools are employed, or slops are thrown on the surface of the ground, and the soil will have a tendency to become damp and polluted; the ports of the ground will become clogged with organic wastes, putrefaction sets in, and poisonous gases are generated.

A village or town without waterworks and sewers, is very seriously handicapped, when compared with another having these conveniences. Industries and population are not so quickly attracted to it; the health of the inhabitants is certain to be poorer, and the death rate higher than it should be, and the full benefits of waterworks cannot be enjoyed until sewers are put in. The value of a good sewerage system cannot be estimated in dollars and cents, and other sanitary improvements follow, which add to the healthfulness of the community.

Pure air, pure water and a pure soil are essential to good health and long life, and one of the greatest polluters of air, soil and water is the contaminating matter from privies, cesspools and improper systems of sewerage, and sewage disposal.

The great point to be kept in view is the removal of the sewage without pollution of the soil, without putrefaction, and consequently without the generation of sewer gas on the journey.

The soil, in the vicinity of the habitations of human beings, "should be kept sacred, and it is sanitary sacrilege to pollute it. He who fouls the air that he breathes, or the water that he drinks, might learn wisdom from the cat, or decency from swine. It cannot be denied that he who fouls the air that another must breathe, or the food that another must eat, or the water that another must drink, should be placed in the criminal class."

Sewerage System to be adopted. Before deciding on the system of sewerage to be adopted, it will be necessary to consider what may be required to be carried away, or disposed of.

This may be stated as follows:—

1. Storm water. This includes rain water from the surfaces of streets and yards, roof water, etc.

2. Cellar drainage, and the removal of subsoil water.

3. Sewage proper. This includes all fouled water, household wastes, wastes from kitchen, laundry, water closet, bath room, restaurant, bar room, manufacturing wastes, etc.

4. Kitchen garbage. Including vegetable parings, waste food, bones, old tins, papers, etc.

5. Ashes.

Kitchen garbage and ashes should in no case be allowed to enter the sewers. This leaves the disposal of (1) storm water, (2) cellar water, and (3) sewage proper, to be considered.

Whether storm water should be admitted to the sewers, or not, is a point that must be very carefully considered, and the line of action taken with regard to it should be very clear and definite, and in order to aid you in arriving at a conclusion, I shall now review the combined and separate systems of sewerage, more in detail.

Combined System. When the combined system is adopted, it is necessary to design the sewers to carry off a certain maximum rate of rainfall per hour. The amount of sewage to be discharged by the sewers is so small in comparison with the storm water, that has to be taken care of during excessive rain storms, that the amount of sewage is not taken into account at all in calculating the sizes of the sewers. It is necessary to ascertain the number of acres to be drained by a sewer, and to decide on the number of inches of rainfall per hour to be discharged, then the volume to be carried by the sewer, and its size can be determined.

Where storm water is to be carried off in the sewers, it is necessary to ascertain the duration and rate of precipitation of the heaviest rains.

A very heavy shower of fifteen minutes may cause more inconvenience and damage if the sewers are inadequate, than a steady rain of a day or two. A maximum rate of a rainfall of one inch per hour, has been considered a liberal figure in some localities, but a rainfall at the rate of from four to six inches per hour is not unknown in Ontario.

One inch of rainfall running off one acre of land in one hour, would amount to 3,600 cubic feet, or an average of 60 cubic feet per minute. The proportion of rainfall which will reach the sewers in a given time, will depend upon such local factors as the slope of the land, whether the surface is covered with houses and paved streets, forests, or cultivated fields, and the permeability of the soil. In some localities, the run off would only be about half of the rainfall. If we assume a discharge of two inches of rainfall per hour, this will amount to 120 cubic feet, or 748 imperial gallons per minute, per acre. In large cities the population does not usually exceed forty or fifty persons per acre, though in some cases it runs to about one hundred persons to the acre. Now allowing one hundred persons to the acre, and each person using seventy-five imperial gallons of water per day, the discharge of sewage would be less than one cubic foot per acre per minute, or less than one per cent. of a heavy rainfall.

When a municipality attempts to carry off the rainfall in the sewers, they apparently lay themselves liable for damages caused by the flooding of the cellars. In order to avoid the damage and annoyance consequent to the flooding of cellars, it is necessary to make the sewers so large, where the combined system is adopted, that the dry weather flow, or sewage proper, only forms a small or trickling stream in large conduits, and cannot remove the mud and sand carried into them with street water, that deposits are formed in the sewers, and render them liable to become foul and obstructed. Even though no sand or mud settled in the sewers, the small volume of sewage in the large pipes will spread out and lose its force. This allows the heavier suspended matters to settle and form deposits which will decompose and become offensive.

One may be told that rain water is necessary to flush the sewers, but it must be remembered that the flow of sewage is continuous, and likewise the dangers from stoppages, while rainfalls are uncertain in frequency, and amount. It is also much more difficult to flush and ventilate large sewers than small ones.

There is no doubt that it is very convenient and most desirable to be able to run the surface and roof water into sewers or drains, instead of having to carry it away in the gutters or open ditches, and it may also be acknowledged that if it is considered necessary to provide for carrying off the surface water throughout, that the one set of sewers, as in the combined system is cheaper than two complete sets of pipes, one for sewage alone, and another set for surface water. However, in regard to the sewerage of Bridgeburg, it may be stated that it is proposed to carry some of the sewers over, or under several watercourses, that at times carry immense volumes of surface water, and that a number of them flow in from other municipalities, and have a large contributary area. To attempt to carry off all this surface water in the sewers would make the cost of the sewerage system so great as to be almost prohibitive.

Separate System. In the separate system, the house sewage is removed through small sewers, and the storm water through large ones, or in the gutters, or it is conveyed to the natural outlets partly by gutters and partly by drains.

The following advantages of the separate system may be stated:—

1. The rainfall being excluded, the sewers are made much smaller than in the combined system, and are proportioned to carry off a comparatively uniform volume, and thus a greater velocity is secured with a given amount of sewage and a given grade.

2. The sewers being small, no deposits occur, and they can be flushed out daily by automatic flush tanks, at the upper or dead ends of the sewers.

3. Small sewers can be much more easily and thoroughly ventilated than large sewers.

4. The cost of the small sewers in the separate system is much less than that of the large combined sewers.

In towns, and small cities, there can be no question as to the superior advantages of the separate system in economy, efficiency, and adaptability to all the requirements to be met.

In the case of cities where considerable areas are paved, and the storm water from them cannot be carried to the nearest stream, without accumulating in the gutters to a degree that would interfere with traffic or threaten damage to property, the combined system might have the advantage in the matter of cost, but where it is necessary to carry off surface water in drains laid below the surface of the street, they can generally be laid at shallow depths, and consequently at a comparatively small cost.

5. Where the sewage has to be purified, it is out of the question for any town to build disposal works large enough to treat the combined sewage at times of maximum rainfall. Some of the sewage must be allowed to pass away with very inadequate, or no treatment at all, and all the processes at the purification works which must of necessity be carried on in a regular and methodical manner, would be interefred with and disarranged

Cellar Drainage. In the combined system the cellars are usually connected with the sewers by a house drain, usually trapped and ventilated. In the separate system, one or two lines of porous agricultural tile are often laid along the sewer, and the cellar is drained to them, instead of being connected to the sewer, but as such drains are liable to get out of repair, the cellar drains should be connected with the sewer in all cases.

Subsoil Drainage. In some instances it will be found desirable to lay special drains for the removal of ground water, and such drains are a great advantage in rendering the soil dry beneath and around habitations, and also preventing the infiltration of ground water into the sewers, but it will often be found, however, that the strata of the ground is so broken by the digging of the trench and refilling it, that level of the ground water will be lowered by this alone, and in all cases an allowance for some infiltration of ground water into the sewers is necessary.

System Recommended. It will be necessary to carry some of the sewers at considerable depths, and in a direction contrary to the natural slope of the ground; for this reason, and the reasons previously stated, I most decidely recommend the adoption of the separate or sanitary system of sewerage in your municipality, but wish to state that no system should be adopted until it has been thoroughly considered, and that the advantages or disadvantages thereof, duly appreciated by as many of your ratepayers as may be gotten to take an interest in the question. In the separate system, it is generally considered best to use 8-inch pipe as the minimum size, in order to lessen the risk of stoppages from articles, such as small sticks, etc., that may pass a trap, although a 6-inch pipe is ample for the sanitary sewage of a residential street of ordinary length. Flush tanks should be put in at the upper or dead ends of the sewers. Roof water should not be admitted to the sewers, as in closely built up areas, the roof water would be the greater portion of the storm water.

Sewer Grades. The grades of sewers should be sufficient to give them a self-cleansing velocity, so that stoppages from the settlement of ordinary suspended matter may be avoided.

House drains should have a fall of not less than one in fifty or a two per cent. grade. It is desirable that the small street sewers have a fall of not less than one in one hundred, where such a grade can be readily obtained, but in a great many cases in your municipality, it is impossible to obtain this grade without a resort to pumping. A grade of 1 in 200 will give satisfactory results where there is any volume of sewage, and at the upper ends of sewers, it is well to have flush tanks in any case. On main or trunk sewers, where the flow is larger or more uniform, the grade may be flatter. On the branch sewers I have adopted a grade of 1 in 200 as the standard minimum grade, and on the mains the flattest grade shown on the profiles is 3 in 1,000 on the Gilmore Road, and 1 in 1,000 on Niagara Street.

In a great many cases, the grades are steeper than is desirable, owing to the rapid fall of the surface of the street.

Trunk Sewers. As previously mentioned, all sewers required for the populated part of Bridgeburg, (with the exception of two or three houses), can be carried to a common outlet near the northeast corner of the corporation.

Two main or trunk sewers are required, one leading east from Amigari, down the Gilmore Road to Niagara Street, and thence northerly down Niagara Street to the site of the disposal works; the other will be along Crooks Street, leading north to Bowen Road, and thence along Bowen Road to a point near the River, where it would turn northerly to the disposal works.

The only objection to the scheme of bringing all the sewers in the area mentioned to the common outlet named, is that the sewer from the Amigari section along Gilmore Road will be at a great depth for some distance.

The greatest cutting will be about 26 feet, and in sewer work it is often necessary to go to a depth of over 30 feet, therefore I do not think that the depth of the Gilmore Road sewer should be considered as a serious objection, or that it would be advisable to run the Amigari sewage west and treat it at a second disposal works, from which the effluent would be run to the Frenchman's Creek. A portion of Niagara Street is rather low lying, and it will be necessary to grade it up for a short distance as shown on the profile.

It might be considered desirable that provision be made for carrying the sewage from the Corporation of the Village of Fort Erie, down the main sewer on Niagara Street, below Gilmore Road, so that the united sewage might be treated at one disposal works, and at the same time avoid any suspicion as to contamination of your water supply by sewage from Fort Erie.

In order to admit the sewage from Fort Erie, into the Niagara Street main at Gilmore Road. it would be necessary to resort to pumping, and this of itself would probably be considered a fatal objection, but this question is one that I consider should not be entirely overlooked.

Depths of Sewers. The depth to which sewers should be laid in the street will be determined by local conditions. They should be laid from two to four feet below the bottoms of cellars and basements. A desirable depth on residential streets would be between 7 and 9 feet, and in business sections the depth should be about from 10 to 12 feet. The maximum depth should be kept when possible, from 14 to 16 feet; in some cities the standard depth is fixed at 10 feet, and in others 12 or 14 feet. I have endeavored to keep the depth of your sewers between 7 and 12 feet, with a maximum depth of from 14 to 16 feet. As will be seen from an inspection of the profiles, the depth of from 7 to 12 feet is pretty generally obtained in your sewers, and the maximum depth rarely exceeds 14 or 16 feet, except along Gilmore Road, where the depth for a considerable distance runs between 20 and 26 feet.

River Pollution. Your water supply is taken from Niagara River, a short distance above International Bridge; you are therefore very seriously interested in the question of whether or not the waters of the upper lakes, and the portion of the river above you is kept free from contamination. The greatest menace would be from pollution by the sewage of the City of Buffalo, which has a population of about 375,000 and empties its sewage into the river, on its east side above you, and into Lake Erie near its outlet into the Niagara River. There are many other large cities, as well as many small cities and towns which empty their raw sewage into Lake Erie; this will have a tendency to pollute the waters thereof, to a greater or less degree.

The question of the pollution of the waters of the great lakes and of the Niagara and St. Lawrence Rivers, as well as the smaller lakes and streams is becoming more serious year by year. It is held by many that dilution alone is all that is necessary, and it is acknowledged that with favorable conditions, the purifying action of rivers is very great. Towns on the banks of rivers of considerable width, and having a fairly constant volume and velocity during all seasons, have discharged their raw sewage into the stream for many years, and investigation has proved that a few miles below the outlet of the sewers there is little or no trace of pollution, however chemical analysis of river water in a polluted area fails to indicate the presence of these minute and deadly bacilli, which escape even through filter beds and are liable to spread disease and death to entire communities. Observations of the River St. Lawrence show that there has been a gradual increase in its pollution, and that where there was an average of 90 colonies of bacteria in 1903, the average in 1906 was 165.

The City of Niagara Falls, Ontario, which takes its water supply from the Niagara River, about 16 miles below the point where it is proposed to empty your sewage into this river, is the first corporation that takes its public water supply from the Niagara River, below you.

The sewage of the city at the present time is emptied directly into the river without treatment. The Village of Fort Erie lies immediately above your corporation, and fronts on the river, but has not yet installed a public water supply, nor a system of sewerage, but when a system of sewerage is installed at Fort Erie you would no doubt look with grave suspicion on any attempt being made to empty raw sewage into the Niagara River, a short distance above the intake of your waterworks.

Sewage Disposal. The best available means for the final disposal of your sewage is the most important part of the whole sewerage problem now under consideration.

The cardinal principle regarding the final disposal of sewage is "that no public water supply may be endangered."

The water supply of the City of Niagara Falls, and of many of the residents along the bank of the river between Bridgeburg and Niagara Falls is that most immediately concerned, but it is not necessary for me to discuss the question of whether the water supply of Niagara Falls or any other place is endangered, as the Provincial Board of Health of Ontario has definitely decided not to allow any municipality to empty its crude sewage into any body of fresh water, and will not now sanction the sewerage plans, of any corporation where no provision is made for installing a disposal plant or sewage purification works, and although the sewage from Bridgeburg is infinitesimal compared with the sewage of Buffalo and other large cities which empty their sewage into Lake Erie, your citizens will be quick to sympathize with any efforts made in the direction of sewage purification, and can readily appreciate the dangers arising from the contamination of your own water supply.

No very definite answer can be given as to what constitutes the endangering of a public water supply owing to our lack of knowledge regarding the length of time disease germs will lie in water. In addition to the question of whether sewage is to be treated or not, there is the further question as to what degree of purification is required, and this is also left to the judgment of the Provincial Board of Health.

The main principles of sewerage construction, aside from disposal works, has been established for many years, but the best means of rendering sewage fit to be discharged into bodies of water from which public water supplies are taken, is a question of the present, or of very recent date, but experience has shown that sewage can be rendered practically harmless, and further experience will no doubt show how better results may be obtained, at less cost.

The greatest danger from sewage is from the harmful bacteria which it contains, but they are not to be dreaded unless they obtain access to the human system; this they rarely do, except through the water supply.

Sewage swarms with bacteria engaged in breaking down organic matter into fixed mineral compounds; organic matter and bacteria always accompany each other, and as soon as the organic matter has been removed, the food of the bacteria is gone, and death comes to them swiftly. It will thus be inferred that sewage purification processes are valuable in so far as they change the composition of the organic matter into fixed mineral compounds. The purification of sewage should involve the breaking up and oxodising of organic compounds and putrescible matter present, and transform them into either harmless elements or stable compounds without any of the offensive and injurious consequences which attend the natural processes of ordinary spontaneous and putrefactive decomposition.

Experiments have shown that "all sewage purification processes to be successful must be subordinated to the requirements of micro organisms, by whose agency alone such purification can be completed." This being the case, it becomes evident how directly opposed to nature's law is any process whose essential features are attempts at sterilization, which would suspend the agencies employed to do the work in hand.

The popular conception of sewage which pictures it to be a vile mass, indescribable in appearance and color is gained from the known contents of cesspools and improperly constructed and neglected sewers—nearly all sewage when fresh, is simply water with about two parts of suspended matter in 1,000, of which one-half may be organic matter. It is this one part in 1,000 which is to be removed or so changed in character as to be rendered harmless, The object of sewage purification being the removal of organic matter and certain processes being available for this purpose, the question is, which one to adopt, and what degree of purification is desired? Broad irrigation need not be considered in connection with the sewage purification works for Bridgeburg, as suitable land for the purpose is not available.

Chemical precipitation, one of the older processes, is rapidly giving way to plain sedimentation and to septic tanks, more generally the latter.

The bacterial processes now coming into general use include the septic tank, contact beds, percolating filters, and slow sand filtration.

Septic Tank. The septic tank, as now known, has been developed since 1894. It is, in effect a sedimentation basin, or an elongated cesspool, so designed as to retain the solid organic matter in the sewage, until it has become more or less liquefied and gasified. The sewage flows in at one end of the tank, and out at the other, commonly through submerged inlets and outlets. The tanks are now generally constructed of concrete, and in cold climates should be closed at the top, and their capacity should be about equal to the flow of sewage for one day.

A detritus or grit chamber, is generally placed just ahead of the inlet of a septic tank, in order to retain mineral solids, which cannot be acted on by the bacteria, and thus liquified. The sludge, or matter which settles to the bottom of the tank, should be removed at intervals of a year or less, although in many cases, it is a matter of surprise how slight is the accumulation of solid matter that occurs in the form of sediment in the tank itself; it has been shown that the whole of the solid matter in suspension is, with proper management, capable of liqufication by biological agency.

The tank effluent, compared with the crude sewage will show a purification of from 60 to 70 per cent. and the filtrate or effluent from contact or filter beds, compared with the crude sewage will show a purification of from 80 to 95 per cent.

Should it be decided that the effluent from the septic tank, to be installed by your municipality, must be further purified before being emptied into the river, the preferable manner of treating it would be by passing it through contact beds.

Contact Beds. Contact beds are filters in which coarse materials are used; the bottom and sides of the beds are generally composed of concrete, or other water tight material; the beds are filled with sewage, stand full, and then emptied, and then stand empty. Each of these periods should occupy from 1½ to 3 hours, according to the type of sewage to be dealt with. As a rule, the filtrate from a coarse grained bed is applied to a bed composed of finer grain; the coarse beds are called primary, and the fine beds secondary; the terms "single contact" and "double contact" beds, are often used. The filtering material in contact beds may be hard cinders, coke, broken stone, gravel, etc. The beds are built for operation singly, in pairs or groups of three; the sewage in the last two cases passing through two or three beds in succession; when built in pairs or groups, the coarse material of the primary beds is approximately from three-quarters to two inches in diameter, and from one-quarter to one inch in diameter for the secondary or fine beds.

The relatively large size of the material composing these beds, and of the interstitial spaces permits quick filling and emptying, and facilitates a rapid renewal of the air supply in the free spaces in the bed. This favors a great bacterial development and a correspondingly speedy breaking down of the organic matter of the sewage.

Holding the sewage in the bed in contact with the bacterial agents gives the beds their name.

Head required for operating disposal Works. Should contact beds be required in connection with your septic tank, it would be necessary to pump the sewage after passing through the tank to a height of between 12 and 20 feet in order to give head enough for operating the contact beds.

The beds should have a depth of from 4 to 6 feet, and the sewage is distributed over the surface, or just below the surface of the beds, and passes out at the bottom, therefore the loss of head at each bed through which the sewage will pass, is rather greater than the depth of such bed.

The septic tank is operated with little or no loss of head, and one can be installed in your municipality without a resort to pumping, all that is necessary will be to place the tank at such an elevation that the outlet will be 4 or 5 feet above the ordinary level of the water in the Niagara River, so that the water of the river, when it is raised to an abnormal height by storms, may not back up in to the tank, and interfere with its orderly working.

The elevation of the septic tank, in order that it may not be interfered with by high water, will cause the grade of the main trunk sewer along Niagara Street to be flatter than would be otherwise necessary, but the tank alone can be put in and operated, without the installation of a pumping plant.

Sewage Purification Plants not Nuisances. There is often much opposition to sewage purification plants by those living or owning property near by, on the ground that these works must be a nuisance, but experience has shown that well conducted plants are entirely inoffensive, either within or without their enclosures. The employees about such works are as healthy as they would be if engaged in other occupations, and the health of the families of men living on sewage farms is as good as it would otherwise be.

Extent of System. The sewers as shown on the accompanying plan will consist of:—

2,750 feet of 18-inch pipe.
3,140 feet of 15-inch pipe.
7,700 feet of 12-inch pipe.
3,890 feet of 10-inch pipe.
25,610 feet of 8-inch pipe.

The outlet in the river will consist of 240 feet of 18-inch cast iron pipe, with flexible joints. The depth of water at the outer end of this pipe will be about 12 feet.

The lengths of the sewers that it is proposed to lay on the various streets, and the internal diameters of the same are as follows:—

Niagara Street, 2.400 feet of 18-inch pipe.
Niagara Street, 3,100 feet of 15-inch pipe.
Bowen Road, 2,700 feet of 12-inch pipe.
Bowen Road, 650 feet of 8-inch pipe.
Crooks Street, 1,320 feet of 10-inch pipe.
Crooks Street, 650 feet of 8-inch pipe.
Highland Avenue, 920 feet of 8-inch pipe.
Emrick Avenue, 1,700 feet of 8-inch pipe.
Phipps Street, 4,300 feet of 8-inch pipe.
Dufferin Street, 2,680 feet of 8-inch pipe.
Dufferin Street, 1,200 feet of 10-inch pipe.
Jarvis Street, 2,130 feet of 8-inch pipe.
Courtwright Street, 1,370 feet of 10-inch pipe.
Courtwright Street, 940 feet of 8-inch pipe.
Klanck Street, 200 feet of 8-inch pipe.
Bridge Street, 500 feet of 8-inch pipe.
Lewis Street, 3,200 feet of 8-inch pipe.
Warren Street, 460 feet of 8-inch pipe.
Russell Street, 1,060 feet of 8-inch pipe.
Jennet Street, 1,300 feet of 8-inch pipe.
Dunlop Street, 670 feet of 8-inch pipe.
Wood Street, 340 feet of 8-inch pipe.
Gilmore Road, 4,400 feet of 12-inch pipe.
Gilmore Road, 1,300 feet of 8-inch pipe.
Gilmore Road, 40 feet of 15-inch pipe.
Smith Street, 410 feet of 8-inch pipe.
Catherine and Erie Streets, 2,200 feet of 8-inch pipe.
Mains to septic tank, 350 feet of 18-inch pipe.
Mains to septic tank, 600 feet of 12-inch pipe.

This makes a total length of 43,090 feet of pipe sewers, or somewhat over 8 miles.

Site of Disposal Works. The most desirable site for the disposal works is on the east end of the block of land known as the Ochinvold tract, which lies between Bowen Road and the lands of Mr. Anderson. An area of five acres at the east end of this block should be secured—this land is very conveniently situated for the site of the disposal works, and the elevation of its surface is most suitable for the various works required. It is unbuilt upon, except for one small house at the northeast corner.

Estimate of Cost. I estimate the cost of the system of sewerage as shown on accompanying plan and profile including the 43,090 lineal feet of sewers mentioned, together with 77 manholes and 13 flush tanks, at $110,000.00, of which amount $33,000.00, is for rock excavation. I estimate the cost of the septic tank, and iron pipe outlet at $5,000.00, and cost of site of disposal works at $10,000.00, being a total of $125,000.00 for sewers, septic tank, outlet in river and site of disposal works.

Should the effluent from the septic tank require to be further purified, and the following additional works be called for, viz.:—

1. A set of primary and also a set of secondary contact beds, similar to that shown on plans, and to be operated with automatic gear.

2. A pumping plant for elevating one day's flow of sewage to a height of 20 feet, in 2 or 3 hours.

3. A high level and also a low level concrete reservoir, each capable of holding the flow of sewage for one day, both reservoirs to be covered.

4. *The necessary Mains.* I estimate the cost of said additional works for filtering the septic tank effluent at $18,000.00.

Report on Storm Water Sewers for City of Woodstock.

By Geo. Ross, C.E., Welland, Ont.

In accordance with instructions received from Mr. Ure, I visited your city on February 27th, with the object of consulting with your City Engineer on certain relief or storm water sewers, proposed by him. My conclusions in this matter are herewith stated in the following report:—

From the information given me by Mr. Ure, it appears there are three portions of your sewerage system, which have been subject to gorging in times of heavy rainfall, viz., that portion of Dundas Street sewer, lying between Vanstart Street and Wellington Street, including certain lateral sewers leading into the same; that portion of the city served by the sewers leading north on Wellington, Victoria and Beale Streets, and that portion of the southern outlet sewer and overflow sewer on Kent Street from Dundas to the creek.

Dundas Sewer. I have studied carefully Mr. Ure's Report and calculations regarding this sewer. I think Mr. Ure's proposed sewers would give you immediate relief from gorging on Dundas Street, and if the growth of this section does not cause extensive laying of pavements, the sewers as outlined by him should be sufficient for the future. The lateral sewers on Riddle, Graham, Light, Brock and Perry Streets, are sufficiently large under present conditions, and if these conditions are not greatly changed, will continue to give the necessary service. The sewer on Finkle Street which has given some trouble, will be relieved by overflowing immediately into the proposed relief sewer on Finkle Street.

Mr. Ure's proposed sewers, viz., 20-inch up Finkle to Simcoe, a 20-inch on Simcoe, and 18-inch on Perry, will take off all the surplus storm water, which reaches the sewer very quickly from the paved area on Dundas Street, and also carry the full capacity of the present lateral sewers leading in that portion of Dundas Street under discussion in this report.

If the areas contained on the streets having lateral sewers leading into Dundas Street sewers are likely to be paved in the near future, I would advise somewhat larger sewers for the relief, viz., 28-inch from Creek to McQueen, 26-inch to Simcoe, 22-inch along Simcoe, and 20-inch along Perry Street to Dundas. From inquiries made and reports received, I judge that not much development of paving may be expected on these streets, but this part of the question I will leave to the discretion of the council for their decision.

The relief required for Reeve Street will be provided by a 12-inch sewer on McQueen and connecting at Finkle. The additional capacity required for this in the Finkle Street Sewer, may be obtained by increasing the grade slightly from McQueen to the Grand Trunk Railway. The present 9-inch sewer on Finkle Street can be connected for relief, to the new 24-inch relief-sewer at Finkle and Simcoe Streets. As this sewer is of very small capacity, it will probably be necessary to connect from Simcoe to Dundas, with a 12-inch storm water relief sewer to get the full benefit of the 24-inch relief sewer. On a portion of the outlet between the creek and Grand Trunk Railway, the grade will admit of using a sewer of a smaller capacity than 24 inches, and still have the same capacity as the main overflow sewer.

In the system as outlined above, I believe your needs will be served in this particular case, not only for the present, but also for the future, providing there is not an excessive increase in growth of buildings, pavings, etc.

Wellington Street. I find the area drained by this street is approximately 29 acres. Over this area, there is a considerable portion occupied by lawn, gardens, etc., and I do not think the run off would be as great for a short length of time as the portions of the city more densely populated. The average slope in this locality is fairly regular and moderate, which also induces a more gradual flow of rain water into the sewers. On this assumption, I do not calculate that with 1¼ inches of rainfall per hour over the whole area, more than 25 per cent. would reach the sewer during the greatest precipitation. As these heavy downpours in this country do not usually last more than one hour, I believe this rate will be satisfactory. This would mean that the lower end of Wellington sewer would have to discharge 650 cubic feet per minute.

As these storm sewers would not be connected to the sanitary sewers, allowance of considerable head during time of storm, can be made without flooding or damage. With this head, and the natural fall of the sewer, a 15-inch from main outlet to Edward, would safely carry the storm water. From Edward to Mary, a 12-inch sewer would be required, laid to a gradient of 3.25 per hundred feet. From Mary to George, a 12-inch sewer laid to a gradient of .7 per hundred would be required. From George to Adelaide Streets, the gradient is much lighter, but as the drainage area is less, I think a 10-inch sewer will be of sufficient capacity.

Victoria Street. Victoria Street will drain an area of about 20 acres, and figured on the same basis as Wellington Street, will require a 12-inch sewer from outlet to George Street, laid to a grade .75 per hundred.

George Street to Princess Street, drainage area 11 acres, would require 10-inch pipe continued at the .75 per cent. grade. Princess Street to Adelaide Street, dranage area about 7 acres, would require the 8-inch pipe continued on a gradient of .75 in a hundred, and would give a capacity of 150 cubic feet per minute when flowing under head.

Beale Street. The drainage area which Beale Street will serve is about 12 3-10 acres, and on the basis assumed for these sewers, would give a runoff of storm water of 320 cubic feet per minute at the lower end of sewer.

From the profiles which I have before me, I estimate a grade for a storm sewer of 2.5 per hundred, could be obtained from Canterbury Street to George Street, with the sewer running under head, and a grade of one foot per hundred from Princess Street to Adelaide Street. A 12-inch sewer laid between Canterbury and George Streets, should in my opinion, carry practically all the storm water from that section, and a 10-inch sewer from George to Princess, at a gradient of one foot per hundred, and an 8-inch from Princess to Adelaide, should serve to carry off the storm water from the area served by this sewer.

In these calculations for Wellington, Victoria and Beale Streets, I have assumed a rainfall of 1½ inches per hour, which may be called a downpour. According to reports, at rare intervals a rainfall of 2 inches per hour has occurred in Woodstock. Such phenomenal downpours coming at rare intervals, may at certain times cause a flooding of the streets which are under discussion. In view of the topography of the town, it is reasonable to suppose that this would not cause damage or inconvenience to any extent, and would speedily be drained and absorbed by the low lying tract to the north of this area.

Storm Water Inlets. All storm water inlets should be connected directly to the storm water sewers. Such inlets should be placed at all street intersections and the bottom of all grades.

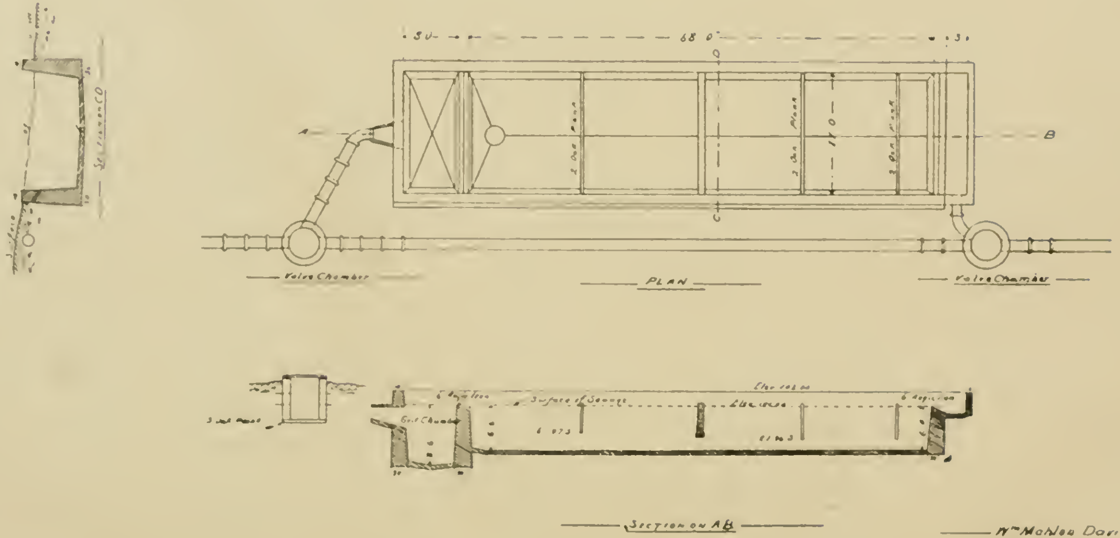
Regarding the Kent Street Sewer. Owing to the steep sloping area on the east and west sides of this street, it is evident that this sewer receives its water much faster than other sewers in the city, and collects very rapidly at the junction with Dundas Street. The new sewers proposed will cut off a large amount of water now reaching this sewer from the north and west, and will likely give temporary relief to the sewer on Kent Street between Dundas and the creek. I am of the opinion, however, that owing to the nature of the contour of the ground served by this outlet, you may expect further gorging after such excessive rainfall as you have experienced during the past year. To avoid the recurrence of this, I think it would be advisable to substitute for the 15-inch sewer, one of 24 inches in diameter, laid to as steep a gradient as circumstances will permit. This will provide for future growth of that part of your city.

It is an established fact that the construction of permanent roadways invariably increases the service which a sewer has to perform, and in my advice in this report, the matter has been given full attention. The size of the sewers as recommended will, in my opinion, be large enough for the present and for all future needs, considering the probable growth and development of your city.

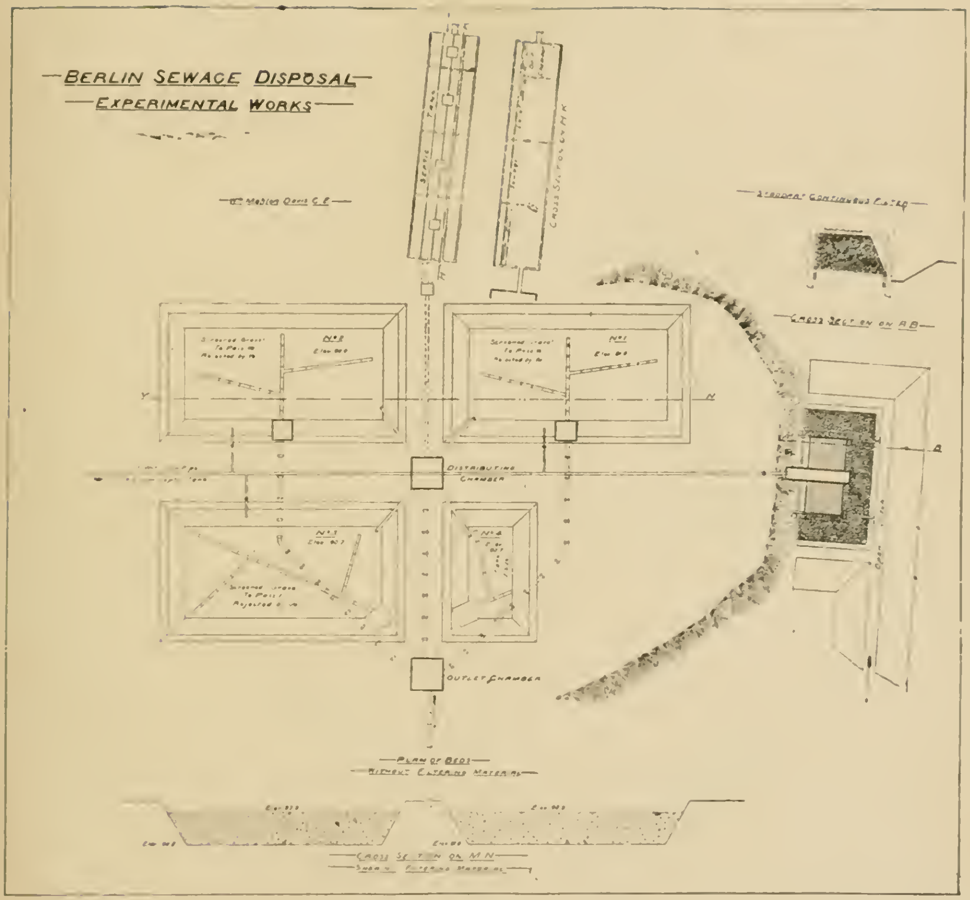
In the extension of your main outlet sewer to the north from Wellington Street to Beale Street, I would not advise a sewer of less diameter than 22 inches. In this sewer, the grade must necessarily be very light, and the capacity therefore very low. This, together with the fact that it lies at the bottom of a large drainage area, with a number of important sewers leading into it, and the probability of a considerable number of extensions to your system in that locality, leads me to the above conclusions.

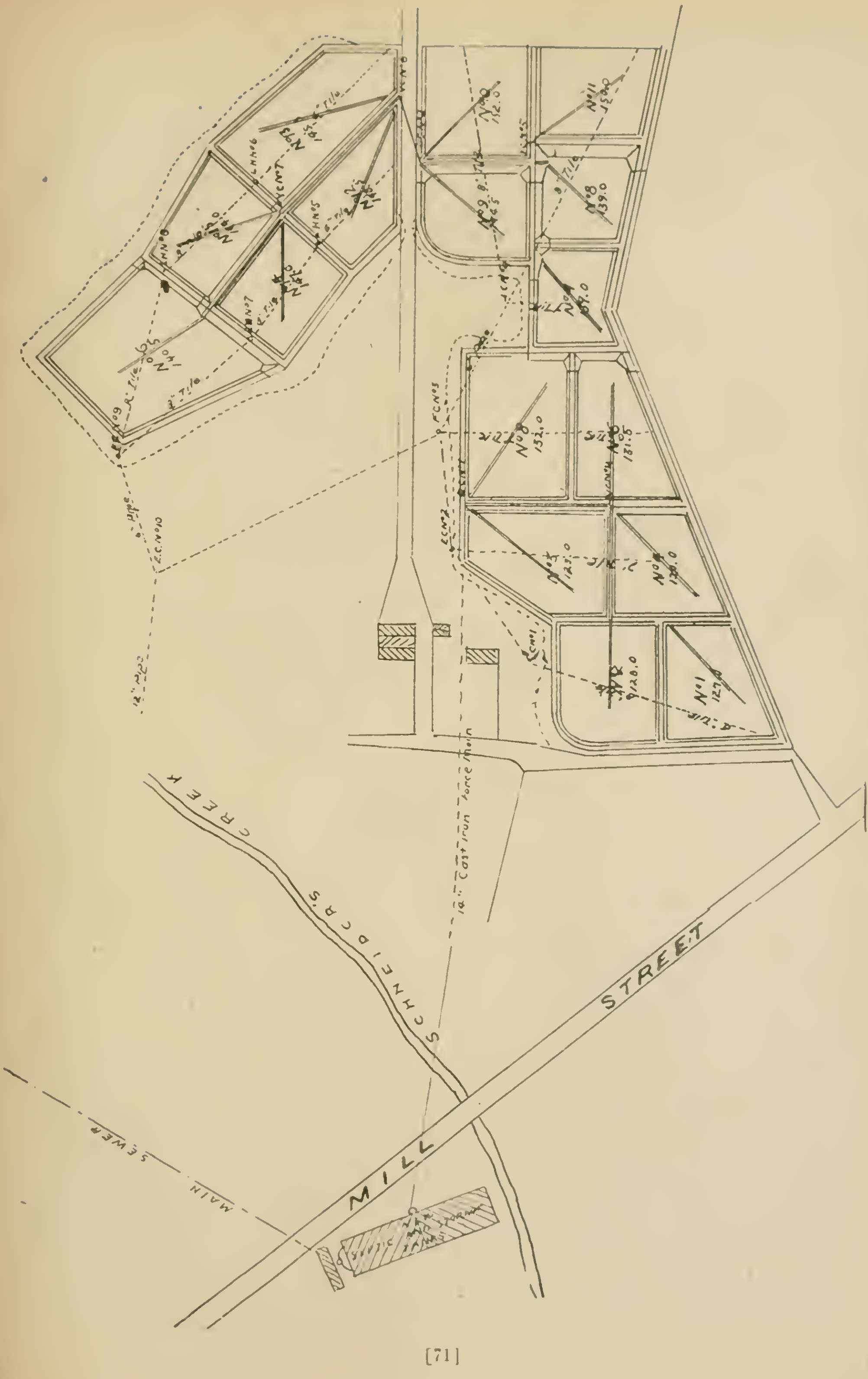
BERLIN
SEWAGE DISPOSAL WORKS Large Septic Tank.

Scale 8" = 1'

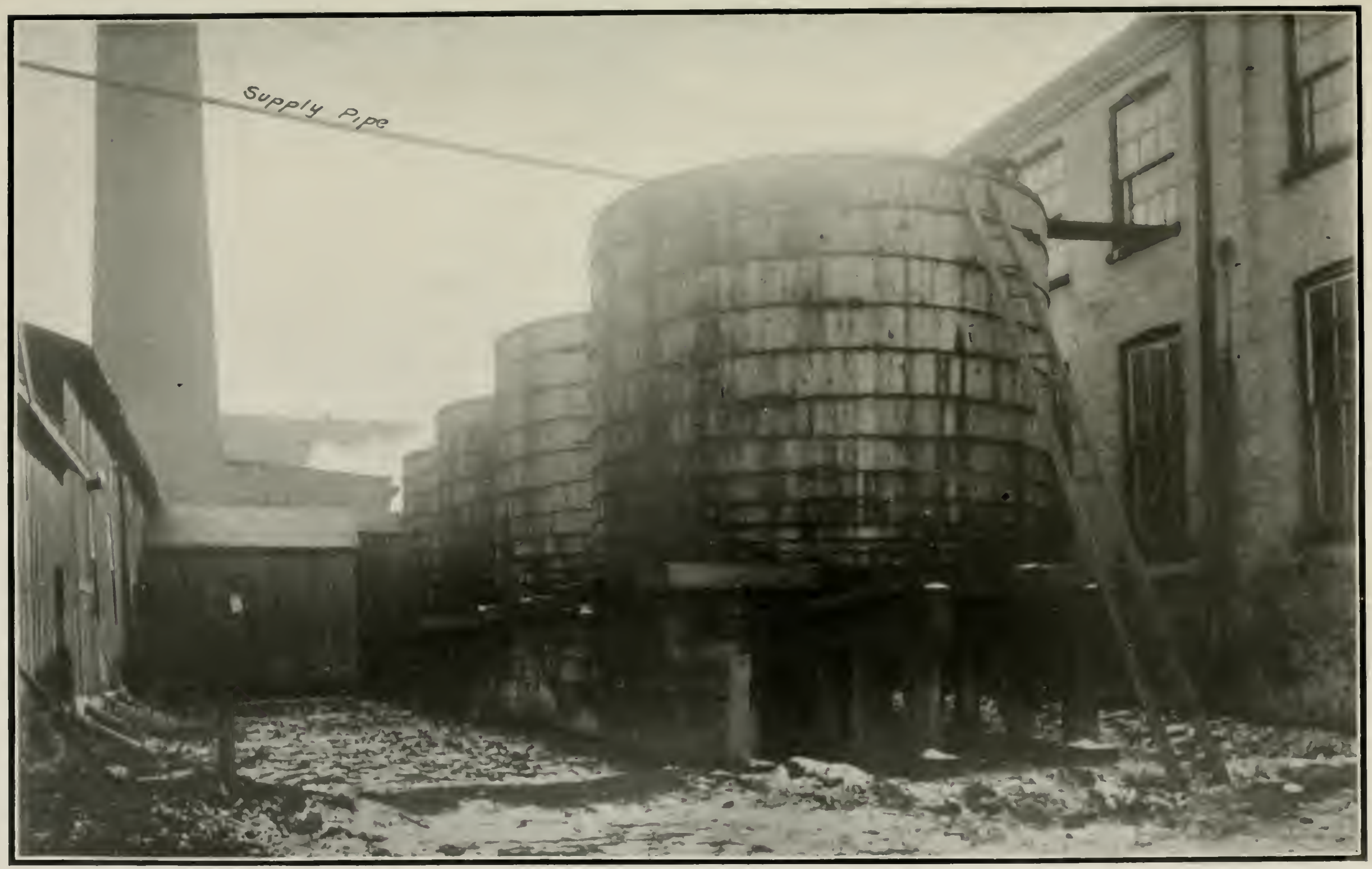


Wm Mahlon Davis
Civil Engineer
Berlin May 1900

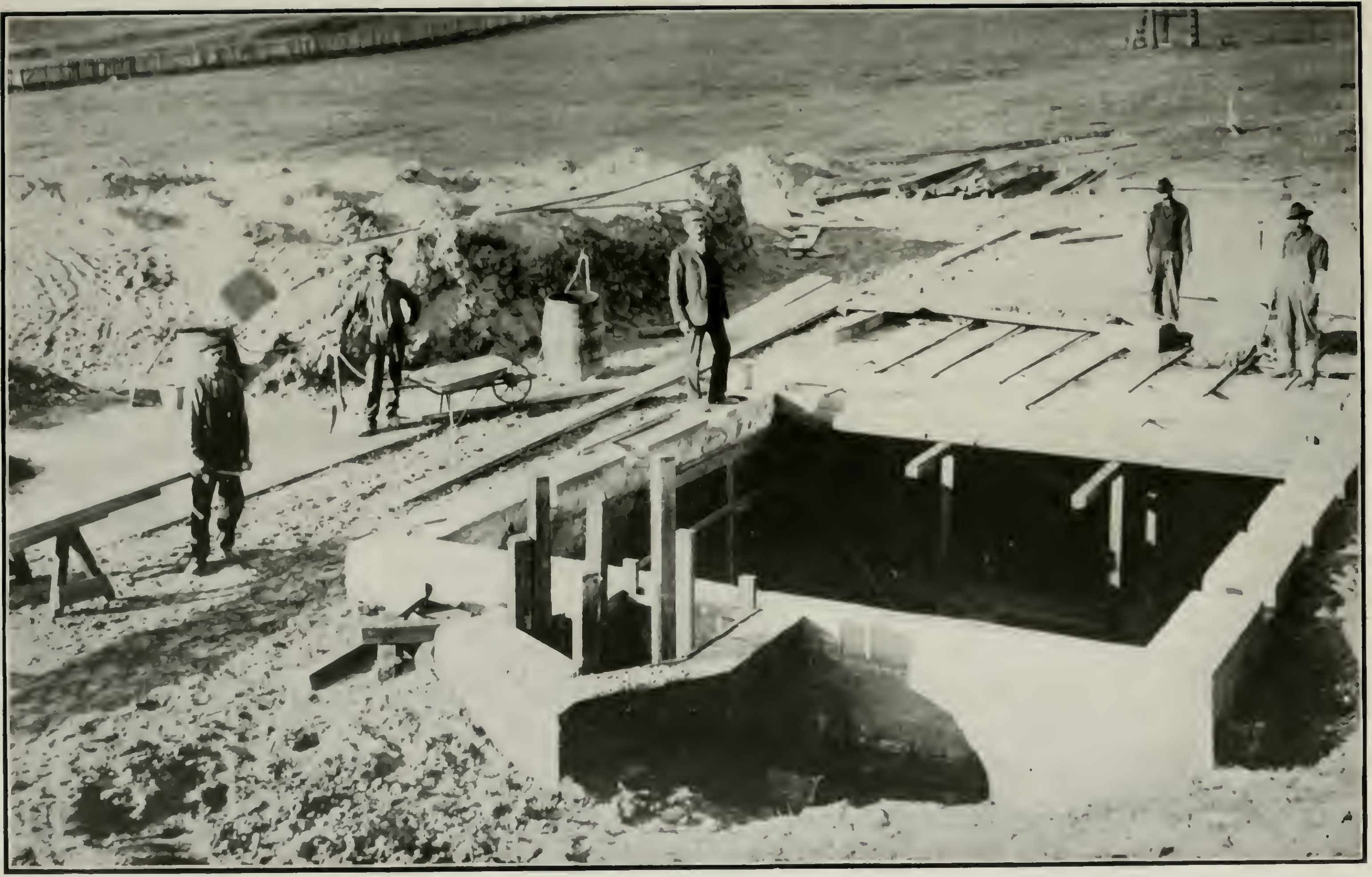

BERLIN SEWAGE DISPOSAL
EXPERIMENTAL WORKS
Septic Tank
Cross Section on HK
Cross Section on AB
No 2
No 1
No 3
No 4
Y
N
A
DISTRIBUTING CHAMBER
OUTLET CHAMBER
PLAN OF BEDS
WITHOUT FILTERING MATERIAL
CROSS SECTION ON MN
SHOWING FILTERING MATERIAL



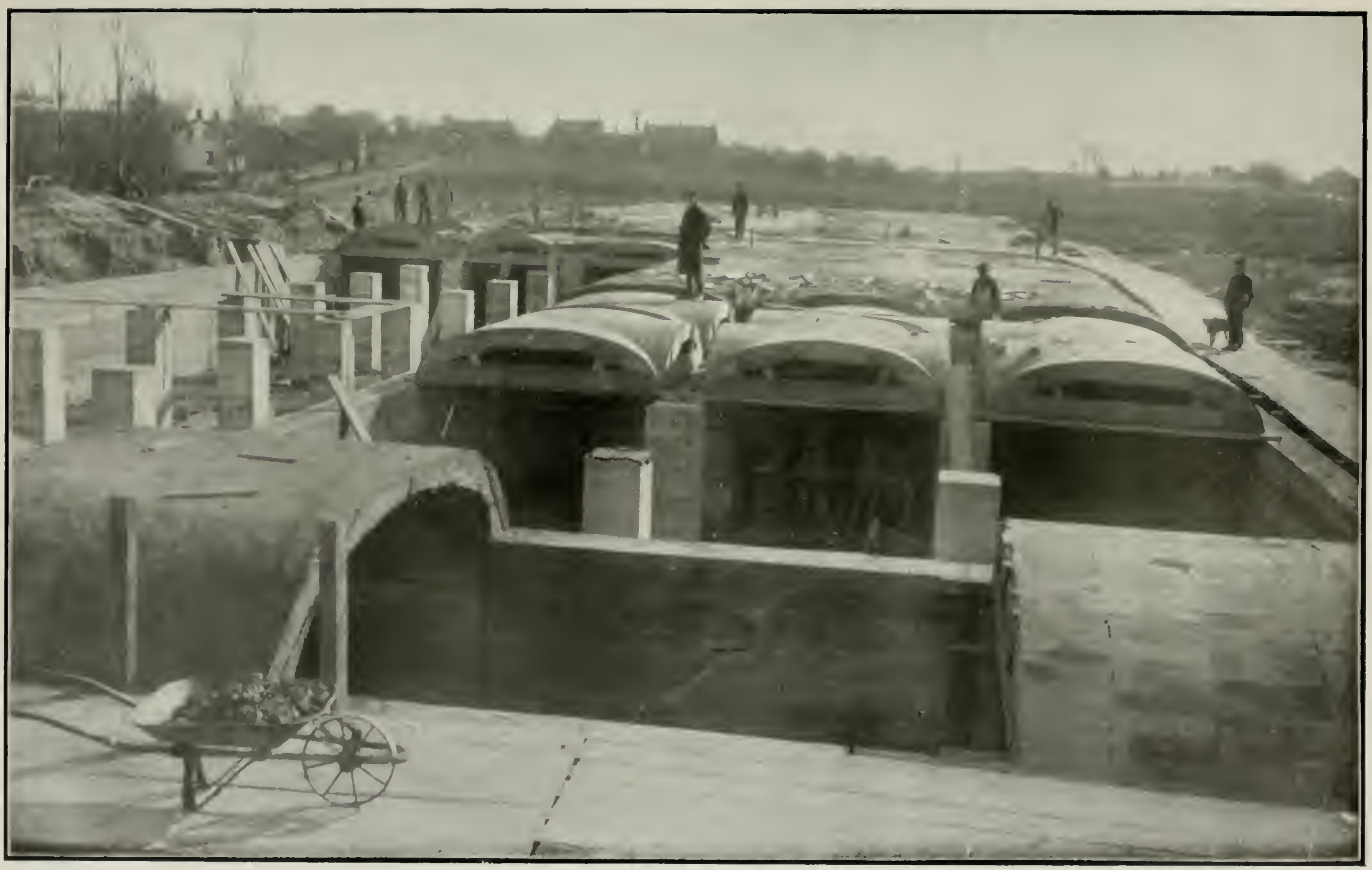
Berlin Sewage Disposal Works. General Plan—Scale 100=1 in.



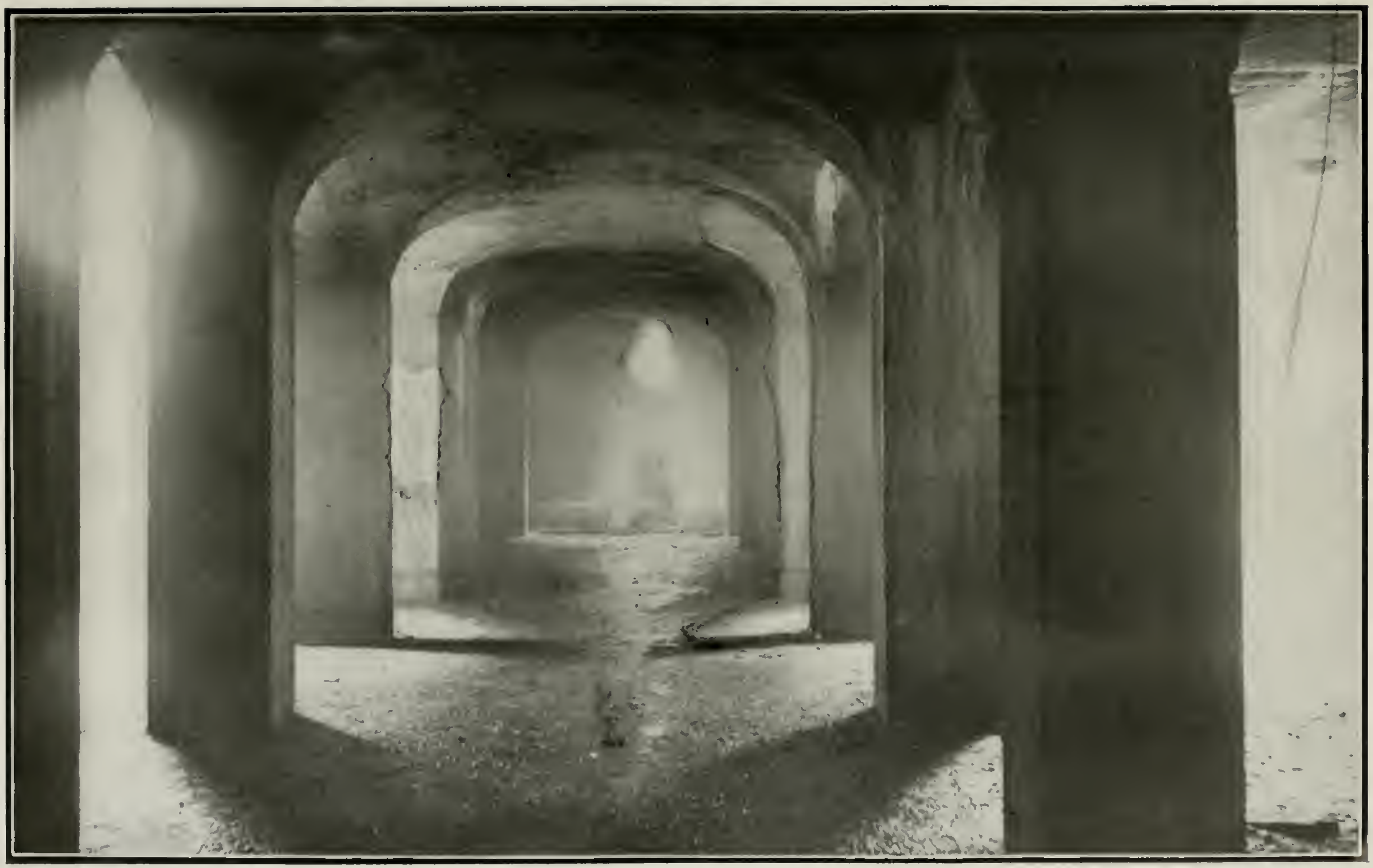
Tanks for preliminary treatment of Factory Waste (Lang's Tannery).



Showing construction of Septic Tank (Breithaupt's Tannery).

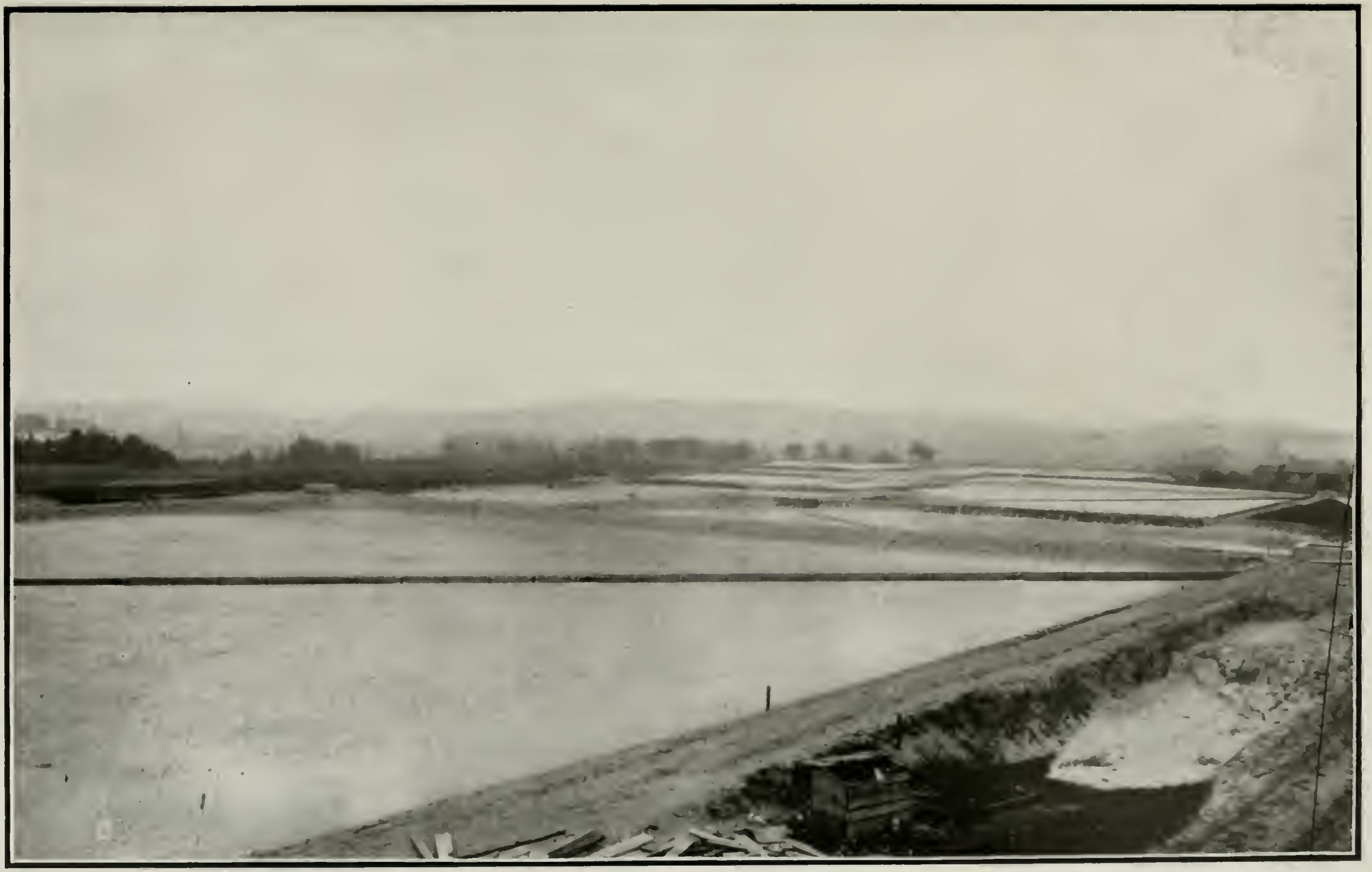


Septic Tank under construction.

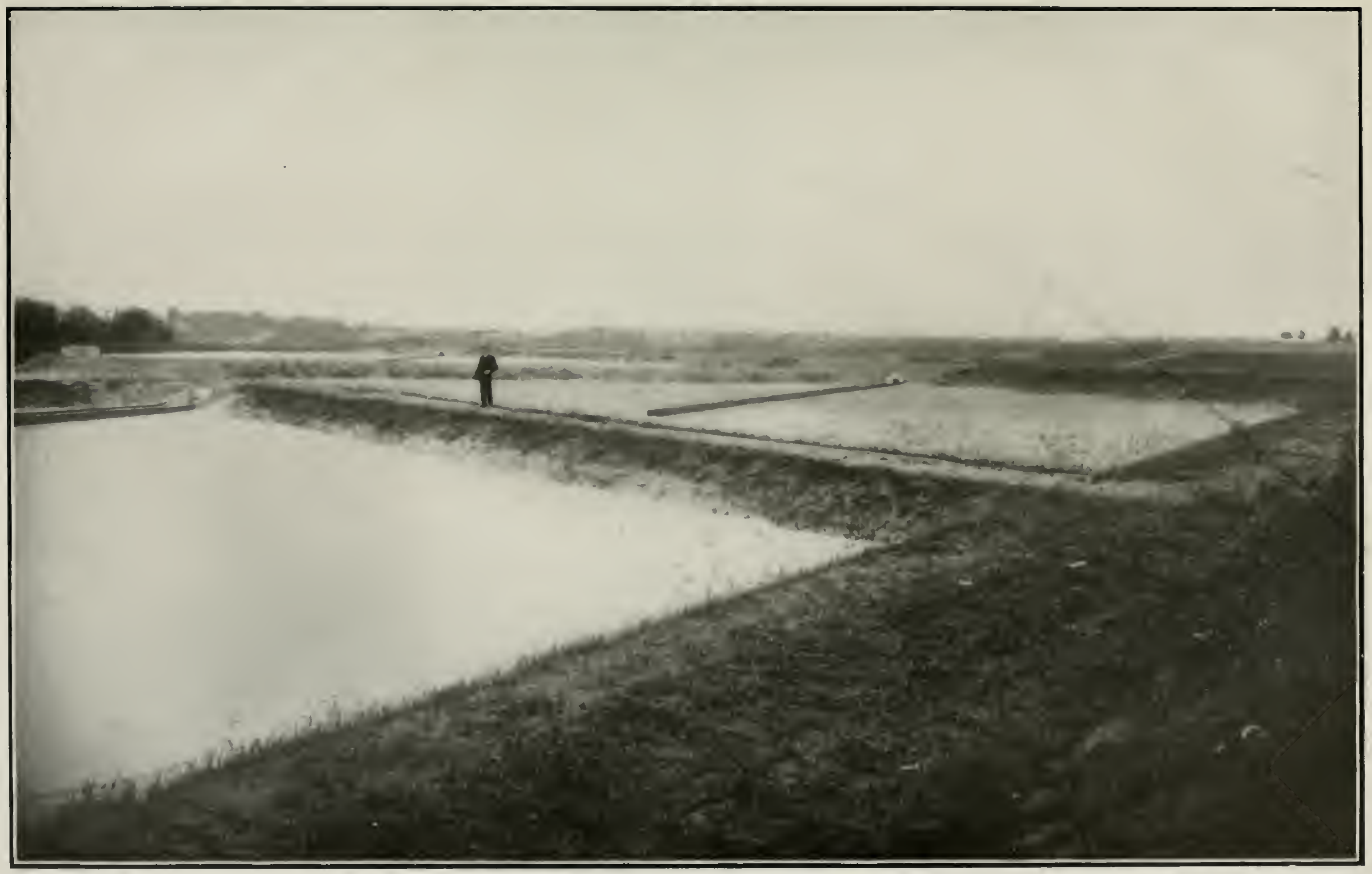


General view of Septic Tank (interior).

View of Bed showing Carrier.



General view of beds.



Beds with Sewage applied.

Appendix.

The Berlin Sewage Disposal Plant.

An epitome of the difficulties met with in the early inception of the sewage disposal plant of a manufacturing town, the experimental work conducted by the Provincial Board of Health in order to ascertain the system of sewage disposal best suited to the requirements of this town, the Report and recommendations of the Engineer under whose directions the present plant was installed and is now operated, with illustrations.

Part I.—Dr. C. A. HODGETTS.

Part II.—Dr. J. A. AMYOT.

Part III.—W. MAHLON DAVIS, C.E.

Introduction.

As a striking example of the progress made in sewage disposal the following brief outline of the work done by the Town of Berlin is herewith submitted and in doing so extracts will be given from several reports made at different times to the Provincial Board of Health to which those desiring to more fully study the history may refer.

The town itself, as its name would indicate, is one of our German towns with a population in 1901 (census year) of———and being a perfect hive of industry it is rapidly growing and as far as general sanitary conditions are concerned it offers a model to many larger and more pretentious towns and cities of our Province.

Indeed the work done in the matter of sewage disposal speaks most tellingly of what a town of its size and enterprise can do, particularly when actions for damages to health and property are instituted and in some cases heavy damages awarded.

The writer in presenting this review of the subject simply desires to present it in such a manner as to indicate the difficulties met with and overcome as regards the different stages in what may be called the evolution of the disposal plant and the treatment of the trade wastes, preliminary to the effluent commingling with the general sewage of the town—and would particularly direct attention to the results under inefficient and insufficient management, as is evident from the reports presented to the Provincial Board of Health, and the excellent results obtained the first year after the installation of the present plant when the Engineer of construction directed the operation thereof.

The report of Dr. Amyot, Director of the Laboratory of the Provincial Board of Health, clearly sets forth in Part II the outline of the experimental work done prior to the designing of the present system, and the conclusions arrived at. In the concluding portion he gives the laboratory results of specimens taken since the completion of the work, so well designed and operated by Mr. W. Mahlon Davis, Engineer of the system, whose report upon the same will be found in Part III.

PART I.

By Chas. A. Hodgetts, M.D., Chief Health Officer, Ontario.

The plans, etc., of the Berlin Sewage System were designed by Willis Chipman, C.E., and it may be presumed were approved of by the Provincial Board of Health, but of this there is no record.

Investigation May 27th, 1896.—On account of complaints made since 1894, by the Local Board of Health of Waterloo Township, an investigation was made by Drs. Kitchen and Bryce, on May 27th, 1896. Witnesses were examined under oath, amongst them being. Reeve Shantz, Dr. Roberts, New Germany, and Mayor Breithaupt. The latter stated that he had been in council at different times, and was Chairman of the Sewerage Committee when system was first constructed, and when sewage farm was made.

The idea was to prepare enough of beds for sewage purposes, and to keep adding as many as the case required. Bought 20 acres at first, and prepared 6; have since prepared about six more acres.

We have found that the old beds did not filter the water as fast as we expected, but found the new beds better. These will take continually more water from being more level, and subsoil tiles not so deep, and trenches are filled with coarse sand, where trenches over tiles at first were filled with material of field soil.

We can have water six inches deep over whole surface, and new ones and old ones would overflow before they are covered. Old ones are not completely improved yet. We had a meeting this spring which was important in this matter. It was decided then to improve old beds, and raise banks on new beds for more water to be put in.

Only one man is employed to take charge of beds. We supply more when necessary. The use of an extra help is determined by the committee.

The conclusions and recommendations of the Committee were as follows:—

1st. That the township authorities have patiently and reasonably endured what complaints were made to them, stated to be a serious nuisance from the towns allowing sewage to escape from the sewage beds, or from the carriers at the farm into the creek.

2nd. That the town authorities have, with a view to economy, supplied very inadequate assistance in the management of the sewage farm, and there would seem no ground to doubt, but that this has resulted in the nuisances complained of.

Your Committee being satisfied on these points, begs therefore to recommend for the approval of the board:

1st. That the Town Council and Local Board of Health of Berlin, be instructed to adopt sufficient and adequate means, whereby the whole sewage will be carried to the farm, and be so applied on the beds in succession, that a proper and rapid filtration of the same will take place before any effluent is allowed to go into the creek.

2nd. Inasmuch as rapid filtration is the condition whereby any danger of local nuisance from decomposing sewage at the farm may be avoided, it is advised that the guard of the beds be improved, so that the sewage will be distributed equally over a bed, or on the ditches, should such be constructed.

That with a view to obtaining the most rapid filtration, the practice be adopted of cultivation or otherwise stirring the surface of the beds, after every two floodings at least, and preferably after every flooding.

3rd. That as the weather grows colder, arrangements of plots should be made with an idea of flooding smaller areas, so that a good depth of sewage may be rapidly attained thereby; having the specific heat of the sewage retained as long as possible.

4th. It would be most desirable, if one or more acres, of say two feet of sharp sand or fine gravel beds, were made with five inch tiles, laid ten inches under the surface, practically on the level, and in rows as close as one tile in three.

By a rapid delivery of sewage under the surface, from the covered carrier, a large amount will be rapidly disposed of, its specific heat retained and work done effectually to an extent not possible by any other method in winter.

Should these several recommendations be gradually introduced, with at the same time keeping steadily in view, the making the farm productive, there will be no reasonable ground of complaints on the part of Waterloo township.

Investigation—by Drs. Kitchen and Bryce. Sept. 25th, 1901.

This enquiry was made at the instance of the Town of Berlin, in consequence of writ to restrain being served.

Amongst those examined were, Mayor Bowlby, Berlin, and two of the farmers residing in the vicinity of the sewage farm.

The evidence of the Mayor, showed the conditions at that time to be as follows:—

(1) Farm consists of twenty acres of land, laid out in beds of ¾ and ½ acres in area, all with subsoil drains, graded, and with dykes around each bed; carriers from main sewer are arranged to discharge sewage on to beds in succession, under the charge of Mr. B. Baetz, foreman of the farm.

(2) These beds consist of a gravelly clay and covered in some beds with a loam composed of fertile humus.

(3) There is also a septic tank, constructed in 1900, under the supervision of Mr. M. Davis, Engineer, of 75,000 gallons capacity.

(4) In addition there were two filtering beds, constructed in 1900, of coarse stone and gravel, with field tiles in bottom to extent of three feet in depth, and of a superficial area of 50x75 feet; the working of the farm and tank and filtering beds is as follows: As the sewage reaches the end of the main sewer it enters a manhole some seven feet in diameter and of about nine feet in depth, from which it empties into the first part of septic tank, called the grit chamber, which, as chamber is filled, flows into compartment No. 2 of tank, which has several divisions therein; then over a weir, flowing into carrier to beds, sometimes to the new gravel filter beds and at others to the ordinary beds; this tank contains some 75,000 gallons, or about six hours flow of sewage, there being about 328,000 of sewage per day, an increase of 12,000 gallons over 1900; the septic tank is covered and is not a source of effluvium nuisance; the septic tank is cleaned regularly, the grit chamber, by an elevated pump, worked by horse-power, every two weeks, and the compartment No. 2 by allowing sewage therefrom to flow to No. 1 being cleaned when necessary; this has been done three times during 1901, January 30th, March 14th, and August 1st. The contents of tank is hauled away to farm and used as fertilizer. The sewage as it leaves the septic tank flows as dirty water, at times brownish from tannery water, and carrying but little suspended matters; when turned on to gravel filter the effluent appears clear, much like swamp water, of a soily tint, except when tannery water comes through it is not so good and smells a little; this water empties into creek; these two beds hold a charge of sewage for about two hours each, each bed holding about 15,000 gallons, each being about 50 feet square

by 75 square; after two hours water is drawn off and bed rested 24 hours; when these two beds are filled we turn sewage on beds as mentioned in plan in succession; each bed would receive a dose of sewage once in four or five days, those beds being flooded which are not used for cultivation; those which are used have been in 1901 four in number, viz., No. 3, 4, 10, 11; on No. 3 Swede turnips, No. 4 sugar beets, No. 10 sugar beets, No. 11 mangolds, No. 5 carrots were tried not successfully; the beds, Nos. 3, 4, and 5, under cultivation, are useless for filtration, the underdrains being clogged; Nos. 10 and 11 filter fairly well; the beds of sugar beets of 3.75 acres will probably yield 2,500 bushels of beets; turnips are poor; mangolds to extent of one acre, are good; the cultivated beds are scuffled occasionally; each has been done four times since planted this spring, and they are hoed; the other beds were ploughed in order, each bed since spring, No. 1 three times, No. 2 once, No. 3 three times, No. 7 once, No. 8 twice, No. 9 twice; these were not scuffled or harrowed. Mr. Baetz has a horse which is used for cultivation and working of pumps; ploughing is paid for by day work, when required; the ploughing is about six inches deep, to gravel over tiles; after ploughing the filtration is, I suppose, twice as fast, but effluent is not so clean, sewage will appear in tiles some two hours after a ploughed bed is flooded, but is better and does not appear as quickly if bed is not ploughed; Nos. 10 and 11 give cleanest effluent except gravel beds; the water which flows from tiles sometimes smells strong of gas liquor and of tanbark smell at times; there are no fish in creek that I am aware of; the smell from beds is noticeable at times quite far away, but I do not mind it; generally at 9.30 to 12 in forenoon the tannery water comes down, as I can tell by its red color; it goes through the tank, but I separate it by putting it in Nos. 10 and 11, if I have room, if not, in 9 and 8; this comes down every day when they work; the gas liquor comes down at any time, as I can tell by the smell and oil on top; I do not do anything with that (differently); the solution from Erbs' Glove Tannery is whitish, lime being used; this occurs every day about an hour; in forenoon about twelve, some blue dye water comes down, not every day, two or three times a week; the new beds will take the color out best.

The Committee reported to the Board the following facts:—

1st. That for the amount and character of the sewage, the area of the sewage beds, constituted as they are largely of gravelly clay, is insufficient for dealing with the sewage without much greater labor being given them than has been the case up to the present.

2nd. That with the addition of the septic tank of the size indicated, and the two artificial sand-bed filters, the area of the beds is insufficient, certainly in winter and in wet weather.

3rd. That with nearly eight acres devoted to cultivation, and receiving but little sewage, there has been a difficulty, even in dry weather, in filtering the 325,000 gallons daily, of sewage supplied.

4th. That in consequence there has been, from time to time, a direct pollution of the stream, with night sewage of a relatively pure character.

5th. That so far as the flooded areas of the beds giving off effluvia of a noxious character are concerned, such may become a nuisance to the persons living within little or greater distances from the sewer farm.

6th. That, while speaking generally, the best managed sewage farms are seldom free from certain odors, yet the Berlin Town Council must show that it has been taking every reasonable means to limit the effluvia from such farm before it can fairly claim protection against actions brought against the town, for causing pollution of the stream and effluvium nuisances.

And summarized the work done as follows: The original farm comprised some 10 acres, laid off in beds, levelled and surrounded with embankments, each of about one acre in extent. These were all underdrained at a depth about three feet. and the beds were flooded with sewage in rotation. Those having preserved the natural loam on top, supplied a fairly good effluent, and filtered at a fairly rapid rate. Other beds which had to be graded as the farm was enlarged, had left a surface of clayish soil without organic matter and, though underdrained, did not have any upper humus to either absorb or assist in nitrification. Such beds were usually utilized for the tannery sewage, and always presented ponds filtering away slowly and losing much by evaporation.

Some of the better beds years ago grew good cabbage, but this was given up as the area required for simple filtration increased. Any such beds, in which the trenches over the tiles were filled with tanbark, have been rendered largely useless as filters, the waters passing downwards very slowly. As there has usually been but one ploughing of the surface of these beds annually, and no systematic record kept of the amount of water applied to each bed, or of the frequency of application of sewage, no data are available for really estimating the amount of the work done, either as a whole, or comparatively by the several beds.

The growing needs of the town induced the Council in 1900 to accept the Provincial Board's approval of the Engineer's plan, of a 75,000 gallon septic tank, and two artificial filter beds of gravel and sand.

These have been in continued use for some nine months, and the great bulk of the sewage has passed, day by day, through the septic tank, and thence been distributed to the older beds, or to the artificial beds. It was noted at first that the septic tank seemed, not only to be of great service for holding back suspended matter, but, also, that the effluent from it was almost wholly soluble, and passed downward through the filters much more rapidly than the raw sewage. It was further found, that the artificial beds not only handled a very large amount of sewage proportionately, but that they also, after some time, gave a clear and better effluent than did any other beds.

Observation seems to have shown that from some cause, whether the notably increased flow of sewage during the past year, nearly 100,000 gallons, or some substances present in the sewage, the scum or mass of decomposed sewage which floats on the septic tank, supported by the gasses of fermentation, has not lately formed, as at first, and as such especially indicates the decomposition of nitrogenous products going on through the microbes present, the conclusion is arrived at that the tank is not performing the amount of work it should, and recommended the adoption of the following measures, to improve the farm.

1st. The Town Council should, by resolution, place the management of the farm under a regular engineer, and, while accepting his suggestions, make him responsible for the conduct of the farm.

2nd. Require of the tannery-owners, the construction of a roughing filter of coke on their own premises, whereby tanbark extract would be filtered out, and any arsenic present removed by combination with the small amounts of iron, salts usually present in coke. The upper layer of the coke can, with the organic deposit left, be from time to time removed, and burnt in the furnaces. The soluble organic materials remaining in the effluent therefrom can be allowed into the sewage and treated with domestic sewage.

3rd. Require a similar coke filter to be used for removal of the tarry products of the Gas Works; these being hydrocarbons, may also be removed with the upper layer of coke and burnt in the furnace. The effluent therefrom may be then received in the domestic sewage.

4th. Require the sewage from the rubber works to be passed over a filter of powdered haematite, or over sand with lime added to the sewage, whereby sulphur compounds will be deposited as sulphites.

By these measures, which, it will be seen, can only with difficulty, and then imperfectly, be applied after these have become mixed in the common sewage, we have a sewage similar to domestic sewage to be treated, and in which microbic decomposition can be set up readily. The results of these processes would have to be watched carefully, analyses of different effluents being carried on frequently.

5th. Extend the septic tanks to at least twice their present capacity; it being remembered that the Exeter, England, tanks, for instance, are large enough to hold a whole days's sewage. By this means not only will the work of decomposition be very greatly increased, but the expense of removing sludge from them will be lessened.

6th. Multiply the artificial sand-bed filters to the extent necessary to give an effluent from them, as well as the several other beds which may receive occasionally charges of sewage of a standard equal to that already set forth as practical.

7th. Cultivate flat beds frequently, so as to promote the nitrification of deposits by the thorough aerating of the upper layers of the beds, and frequently pass the cultivator through the rows of cultivated crops, which may be grown in summer with profit.

8th. Until such additions to the works as are here indicated, have been made, secure the temporary use of neighboring land upon which sewage may be pumped, and thus be prevented from flowing into the creek.

In 1902—the Legislature appropriated $2,000.00 to carry on experimental work in the interests of the municipalities of the Province, and it was subsequently decided to carry on these experiments at Berlin. The total cost of this work was, $2,919.15—and the recommendations were as follows:

1. *Reservoir*—to hold 24 hours sewage.

2. *Septic Tank*—as an auxiliary of a capacity of not less than 450,000 gallons.

3. *Intermittent Sand Filtration*—for which purpose ample land is to be had in the near neighborhood.

PART II.

By Dr. J. Amyot, Bacteriologist, Provincial Board of Health.

In the early part of 1902, a deputation composed of representatives of several municipalities, principally in Western Ontario, waited on the Government requesting that something be done to assist them by some sort of reliable experimental work, to get trustworthy data to assist them in choosing *especially* methods of sewage disposal.

Berlin presented the most difficulties so was chosen as the place to begin with.

Some eleven years before on account of the fact that Berlin, wishing to get an economical fall for their sewers, had directed them to Schneider's Creek at the south of the town, and was in consequence causing a nuisance to those living along this creek,—a *broad irrigation* plant or a sewage farm was put in. At this time only about one-quarter of the town was sewered, and the town was smaller, much, than in 1902—and again, no manufacturing waste was being discharged into the system. The plant installed was adequate and no complaint was made. But as years went on and the town grew, more were connected with the sewers and factories one after another were connected up (these factories were especially troublesome for they were chiefly such as work with organic substances) (tanneries, wool-washing, etc., breweries). Complaints arose of course under these conditions, the original farm which was only of some 11 acres in area, grew less and less efficient, and to make things worse was badly managed—and besides an attempt was made to derive profit from them by growing crops. This last reduces the capacity of such sewage plants as much as 40 per cent.

Under these conditions it is not to be wondered at that complaints came in faster and faster.

In 1902 the quantity of sewage had increased to a daily flow of 400,000 gallons. The creek in ordinary summer weather had a flow of about 1,000,000 gallons daily. The water below the farm was in a filthy condition. The air about was most foul.

The only reason that the town had not up to this time been sued for heavy damages, was that those chiefly affected were Mennonites who are extremely adverse to forcible means. This was played on by the authorities of Berlin to the unbearable limit. It was a case of continuous promising and jollying.

Dr. Bryce took considerable interest in the question, and I believe was backed by the Provincial Board of Health in recommending septic tank treatment with more land filtration; and even once Dr. Bryce advised them to pump the sewage to the neighboring sand hills.

A very much curtailed attempt was made to follow these recommendations. A septic tank of 60,000 gallons capacity was built. Of course it did not work. It should have been at least seven times that capacity. It was actually only a grit-chamber or catch-basin. Instead of increasing the acreage or of using the sand hills, they constructed a gravel bed about 100 x 150 ft. and tried to put all their septic tank effluent through it. Again a failure resulted.

Now with expectations up at one time, bluffing of those down below going on all the time, the inevitable failures—and then the opprobrium heaped on from all sides on everybody connected therewith; and the attempt of those responsible to clear themselves, the Provincial Board of Health being farthest away and not knowing what was being said nor answering back, got all the blame. The incredible statement was continually reiterated, that this plant had cost them $20,000. The *expert* in charge was being paid $28.00 a month for running the plant.

Many in the town had come to the conclusion that the sewage could not be treated on account of its peculiar composition. Effluents from the gasworks were believed to be antiseptic. Also that from a rubber works—one-third of the sewage of the town was from the four large tanneries then in operation. Those down below were in a despondent condition.

When this condition of affairs was seen, the most searching and complete investigation was decided upon.

Plant, (of an experimental nature of course) was put in to investigate every phase of the question.

The effect of the gas-effluent was tested by two septic tanks one above, the other below the outfall from the gas-works. This showed that the gas-effluent had practically no effect on septic action. That the chief difficulty to be looked for from the gas products, was a mechanical one. This test was carried on for four months.

To see if the combined sewage was treatable by bacterial methods, five months' work was done. This showed it was treatable, though slightly more slowly than ordinary sewage. The most efficient time for septic tank action was worked out. It was found that when there passed through a tank of 100,000 gallons capacity, 100,000 gallons of sewage per 24 hours—that nearly 60 per cent. organic removal was possible; that when 120,000 gallons were passed through at the same time, 50 per cent. only was obtained. Ordinary septic tanks, properly constructed and maintained, were generally considered not to be able to remove more than 50 per cent. We were by this experiment able to show what capacity their septic tanks ought to have in order to do the most efficient work under their conditions.

Contact beds had been strongly recommended, and much had been expected by Berlin from their proposed installation. We were able to show by testing different rates of dosage and different sizes of materials, that such beds were unsuited for the requirements of Berlin.

We tested the Stoddart Continuous Filtration Method and showed that it also in its present state of development was unsuitable for their purposes.

We also made experiments to find what was the best plan to recommend to the tanneries, especially to see what modifications of their effluents would give the town's plant of disposal, the greatest protection and the least work to do. On our recommendation plant was put in at certain of the tanneries to the greatest benefit of the town.

The plant required to carry on these experiments consisted of five septic tanks four filter beds, one continuous filter with sprinkler and a laboratory, all costing in the neighborhood of $2,800.00. The town supplied us a room for the laboratory, and allowed us to use the town water free. We were charged for gas and for their engineer's time during construction of the various parts of the experimental plant. We paid for carriage to and fro between the laboratory and their farm. Berlin paid towards the experiments about $20.00.

At the end of the six months' experimental work, recommendations were made for the plant which they are just now reluctantly finishing, after having been forced on two or three occasions by the courts to go on.

The same work done by an independent firm would have cost them from twelve to fifteen thousand dollars ($12,000 to $15,000).

The same sort of work being done now for Columbus, Ohio, is costing that city sixty thousand dollars ($60,000).

After our work was done and our recommendations made, the Town of Berlin sent their engineer and their chairman of the Sewage Commission to the Eastern States. On their return they reported having confirmed all the data of the recommendations, and advised the installation of a plant following them in detail. Considerable hesitation was manifested to carry out this recommendation. This was the last straw. The Mennonites finally rose to the occasion and entered suit. The town was beaten at every point. They were found to cause nuisance. They were ordered by Judge Meredith to install the plant recommended. Judge Chisholm of Waterloo County was appointed to assess damages—all have not yet been settled. These with costs will likely amount to $16,000.00. One award of $2,400 was appealed against. Five hundred dollars was added by the Judge trying the case on account of odor (sentimental). The septic tanks and the reservoir had been constructed some months ago. The town tried to quit at this, but were finally ordered by he court to continue the construction, and were given until September 1st, 1905, to complete it.

Report of Dr. Amyot, on the experiments carried on in Berlin in the year 1902, at a cost of over $2,919.15. (Special appropriation, $2,000.00).

Recommendations.

1. *Reservoir* to hold 24 hours' sewage.
2. *Septic Tank* as an auxiliary of capacity not less than 450,000 gallons.
3. *Intermittent Sand Filtration*, for which purpose ample land is to be had.

REPORT OF THE WORK DONE AT BERLIN, ONTARIO, IN 1902 AS PER REPORT OF THAT YEAR.

The first visit made to Berlin was on March 28th. The five days were spent visiting twenty-three of the town's factories. Thirteen of these were found not to give any waste beyond domestic sewage to the system. These thirteen factories included a glove works, two leather shoe factories, one felt boot factory, a biscuit factory, two iron foundries, three furniture factories, a chemical works, one cloth button factory, and a white goods factory. Ten factories were found to give wastes to the system, peculiar to themselves, and of sufficient importance to be considered separately with reference to their influence on the system. Of these ten factories, there were four tanneries, one gas-works, one brewery, one wool and felt mill, one shirt factory, and, finally, one rubber shoe factory. The following are the findings of these investigations.

1. *Rubber Shoe Factory.* Here twelve thousand gallons of water is used, some supplied by the town, and an additional quantity pumped by themselves from an artesian well. The crude rubber is crushed and washed in water, merely gravel and coarse vegetable matter, leaves and twigs, coming away. All the rest of the process is a dry one. Nothing of a chemical nature of any kind is thrown into the sewers. The water, other than that used to wash the crude rubber, is used for the purpose of cooling the rollers only. The artesian well water here has at times a very strong sulphide odor. No organic waste, then, beyond a domestic sewage comes from this factory.

2. *The Shirt Factory.* No dying whatever of goods is done here. The goods are made up and then laundered. In this process a large quantity of soap is used. About 12,000 gals of water a day are taken here. About the only thing to consider from here is the fat from reduced soap and from the fresh goods, and is not thought to be of such moment as to require any form of treatment at the factory.

3. *The Button Works.* Here besides making buttons, a quantity of them are dyed. During the year, a carboy of hydrochloric acid, a small quantity of sulphuric acid, oxalic acid, bichromate of potash, sulphates of iron and copper, and not more than five pounds each of the various aniline dyes are used. The effluent is generally hot, nearly all the dye is exhausted before being discharged in the sewers. Nothing here at the present time, and in the present quantities used, would cause any serious hindrance to bacterial treatment of the sewage. It is all lost very soon by dilution with the sewage.

4. *The Wool and Felt Factory.* Foreign and domestic wool, in the raw state, are made up into yarn and wollen goods and felts. Wool rags are also used in the process. Anything infectious in the finished wool is removed by the process. There is nothing, though, to prevent bacteria unkilled passing into the sewers during the preliminary washings given to the rags and raw wool. In washing, and afterwards in fulling, a considerable quantity of soap, sodium carbonate and certain ammonia soap compounds are used, extracting a considerable quantity of fats. No attempt being made to retain them, they go right into the sewer. A great part of the yarns and felts made are dyed on the premises. In the process the greater part of the dyes are exhausted; what goes into the sewers is negligible. The fats from the washing and filling in this factory should be held back from the sewers. A storage basin, giving time for settlement of the sludge, and baffled on the upper surface to catch the fats, would serve the

purpose here, and pay for itself probably in the fat held back. What would then go down would be of little consequence.

5. *The Brewery.* The only waste from here to the sewers is washings from the kegs, barrels, bottles and floors. Considerable finely divided vegetable matter gets into the sewers in this way, and reaches the disposal works. All this material is very tardily putrescible, and is apt to sludge up the beds. Barley husks in considerable quantity may be found at times on those beds receiving crude sewage. With a little care, fine screens would hold this back.

6. *The Gas Works.* Gas is made here from the volatilization of partly exhausted crude petroleum, scrubbed with water, and freed of considerable of the sulphur compounds by passing over slacked lime. During the scrubbing, the heavier oils are resublimed. It is not as harmful, from a chemical standpoint, to the life of bacteria as the product from coal gas. It appears to be chiefly harmful in that, mixing with particulate matter such as hair, etc., it blocks the sewers, but on filter-bed surfaces one could hardly conceive of anything worse. It scums it over, prevents almost absolutely any entrance of oxygen into the bed underneath, and thus defeats seriously aeration, one of the most important parts of a sewage disposal plant, whether broad irrigation, intermittent sand filtration, or, especially, contact-beds.

The creosote substances remaining in solution in the effluent from the works are soon rendered inert by dilution with the sewage. The heavy oils, though, entering and settling at the botton of the septic tank, may give off a sufficient quantity of antiseptic to, at least, cripple the bacteria in their functions.

A very slipshod attempt has been made to hold back these heavy oils at the works; but this summer they were particularly careful, for only on two or three occasions did they allow any very appreciable amount to come down. But coming down once in a while is still very damaging to any disposal plant. This material is practically non-decomposable. Proper settling tanks, baffled at the surface and at the bottom, if properly looked after at the works, would hold back all this substance. A double set of such tanks should be provided, so that the course of the effluent could be directed to one set whilst the other is being cleaned out. Otherwise, in the process a sufficient quantity to do harm will be certain to escape. If a system of pumping the sewage is finally adopted, this tarry substance will be found still harmful in another way unless the pump be a centrifugal one. The pistons will become fouled, and considerable damage may be done. In one of the cities visited in the Eastern States such a settling tank was introduced at the gas-works, where, so long as care was taken to clean it out regularly and carefully enough to prevent tar getting into the sewers, all went well. Any negligence was immediately felt at the disposal works. In spite of protests, once in a while tar would come down, giving a good deal of trouble, especially with the pumping plant. Finally, the town obliged the gas-works company to seek their own outlet for their sewage, prohibiting entrance into the sewers.

7. *The Tanneries.* There are are four tanneries discharging their wastes into the sewers. Between the four, about 150,000 gals. of sewage, at a low estimate is being run into the sewers each twenty-four hours during week days. Three classes of leather are produced—harness leather, sole leather, glove and shoe top leather—and three processes are in operation. For glove and shoe top leather the picric acid and the chrome tanning method is used, and between the two factories using this about 20,000 gals. of effluent is discharged each day. They use between them 70 or 80 carboys of hydrochloric

acid in a year, with the necessary amount of potassium bichromate. This substance, the "chloride of chrome," is decidedly antiseptic, and would stop bacterial action; but, fortunately, most of it is exhausted before it reaches the sewers, and, when it does, it is diluted to such an extent that it does little harm.

Both of these factories use moist hides in the process. The hides are first washed and soaked in water. This water is sent into the sewers. There is nothing to prevent pathogenic organisms going on, although, after the liming process that the hides are next subjected to, such organisms are probably killed. These tanners disclaim absolutely using any arsenic in this liming process, though in the eastern section of the United States such large quanitities of sulphide of arsenic are used that, even diluted it comes to be dangerous. If used as there used, this arsenic would be antiseptic and harmful to any bacterial system of disposal. The lime itself is useful in the sewage, in that it helps to keep it neutral and acts as a precipitant; but, unfortunately, a considerable quantity of it settles in the sewers and gives rise to a good deal of trouble. The third part of the process, the chrome treatment, would destroy any pathogenic bacteria present. The chrome is practically all taken up by the leather, and very little of it goes into the sewers. In this process there are, thus, three classes of effluent, the hide washings, the lime and lime washings, and, finally, the chrome liquor. All these at present are sent into the sewers at different times, and, of course, in varying quantities. The damage done could be greatly neutralized by mixing the whole twenty-four hours' sewage, and allowing it to stand; there would settle out a considerable sludge, carrying down a very large percentage of the organic matter present, from 30 to 50 per cent. of it. This would mean a great saving in the way of disposal plant, and, besides, would remove a great deal of the most obnoxious of the materials given to the sewers by this method. The expense to the manufacturers would be very little, as the plant itself would be simply tank capacity enough to hold twenty-four hours' sewage. The chemicals would precipitate one another, a comparatively innocuous effluent would leave the place. They, of course, would have to carry away the sludge, and their tanks would have to be constructed so that this could easily be taken out of them. Some return could be made from the sale of the fats gathered at the surface by the baffle-boards, and these fats form no negligible quantity either. It would pay to hold and render them.

Sole-leather is manufactured from moist and dry hides. Most of the dry hides come from foreign countries, chiefly Argentina. "Fallen hides" are unavoidably amongst them. These are dangerous. Of course, all these animals have not died from communicable diseases; unfortunately anthrax hides sometimes find their way amongst them. Two tanneries in Berlin are tanning sole-leather. In the case of the moist hides, after washing and soaking in water to rid them of dirt and common salt, they are placed in a lime paste to loosen the hair. They are then washed in water, a good deal of the lime going down the sewers. They are then rid of hair, and treated with an acid chiefly sulphuric, and put into a hemlock bark leach, to spend from four to six months in it. This leach is used over and over again, sometimes for two years. The hides after coming out of this are washed in water, the waste going into the sewers. In the smaller of the tanneries the spent leach is sent off into the sewers; at the larger one, and it is very acid here, it is sent off by another route, not entering the sewerage system of Berlin.

When the dry hides are used, they are previously soaked in water to soften them and to get rid of the small quantity of arsenic attached, which has been put there when packing, out of a watering can, to inhibit the growth of moths, etc. It is not sufficient in quantity to act as an antiseptic to the hide. Dr. Ellis says there is so little arsenic present in the vats in which this soaking takes place that cattle could drink the water without getting enough to produce any symptoms of arsenical poisoning in them. This arsenicated water goes into the sewers. It cannot do any harm there, except as a carrier of pathogenic bacteria.

The hides from this are again washed, and finally sweated in a warm room to loosen the hair. After removal of the hair, the hides are placed in an acid solution, and then into the hemlock leach vats. Up to the acid treatment there is nothing to kill pathogenic bacteria. From that out, probably, this takes place, viz., during the acid and tanning treatment. From this place the only tannin solution going into the waters is that washed off the hides after they are taken out of the vats. And this is fortunate for Berlin's sewage disposal plant, for what they send out by their own private methods is extremely acid, and would be decidedly harmful in the sewage. Milk of lime hardly neutralizes it, except when used in great excess. A great waste of acid is going on here. A large quantity of water is used at this place, and nine-tenths of it goes into the sewers. They make an attempt to hold back the coarse solids at least, but considerable fine suspended matter gets away to the sewers. This could be held back as well as the fats by the settling basin, without anything further, except to hold the whole twenty-four hours' supply. A very large sediment forms in a standing bottle of this sewage.

In the manufacture of harness leather, moist hides entirely are used. These have been cured in common salt. The hides are washed, treated to lime paste, no arsenic, and the hair removed. They are then placed in a bark leach and changed from vat to vat over months of treatment. The tannins are not used for as great a length of time as in the sole leather process. The sewers get the benefit. Usually some one vat is emptied each day, but more especially on two days of the week. These tannin liquors are objectionable, more from the aesthetic than from any other point of view. Nearly all the ground waters about Berlin contain iron, and, of course, blackening takes place as soon as the mixture with this tannin is brought about. The septic tank and the best of the contact-beds removed the greater part of these tannins. These tannins are chiefly responsible for the "huckle-berry milk" color which Schneider's Creek water assumes when the sewage enters it. The purplish black precipitate is made up of tannates and gallates, etc., of iron. The effluent from this tannery is of three kinds, washings from the hides, lime liquor, and tannins in solution. All of these come at different times of the day. We found, experimentally, that the tannins were lost, to an extent, and the organic substances reduced by from 35 to 40 per cent. by merely holding all the effluent together in the one receptacle for twenty-four hours, a considerable sludge settling to the bottom.

No form of settling tank for any of the tanneries with a less capacity than that of the twenty-four hours would be sufficient to be of any value in sedimenting this sewage.

I have found a willingness in all these tanneries to do all that would be required of them to reduce the difficulties from any cause on their part, even to go to the extent of pumping their sewage into such tanks as would be found necessary.

Glue works. This does not give any effluent to the sewers.

After this inspection of the factories was made, the trip to the Eastern States was undertaken. The sewage plants visited were those at Boston, at Andover, at Clinton, two at Hopedale, at Brockton, at Worcester, at Framingham, and the Experimental Station at Lawrence. The greatest kindness was shown me at each of these places, and every facility given me to learn what there was to be learned at each place; and a good deal of inside information was got. Intermittent sand filtration is the favorite down there, and they have good reason in their preference. It shows the best effluent; they have plenty of sand, the labor is small, and need not be over-skilled, though several of these plants have technically trained men in charge. The plants work about as well in summer as in winter. They have not taken very kindly to the septic tank preliminary treatment. Probably necessity has not driven them to it. Where they have been installed, except at Andover, they are well satisfied, yes, more than satisfied, with the results. At Lawrence, the work is still being faithfully pushed on at the present time, especially along the line of sewage disposal, and there especially with the different bacterial methods, septic tanks, "contact" beds of various kinds of "continuous" and "intermittent" filters. At the time of my visit, six skilled men were working here, besides the unskilled labor about the place. It is a little hive of enthusiasm.

Average Daily Flow of Sewage at Berlin.

This was measured during the dry weather by weiring at the disposal plant. Readings were taken every hour on eleven different days, and showed the quantity arriving during each twenty-four hours to be approximately 450,000 gals. In appearance it varied at different times during the day. From seven to nine o'clock it looked like ordinary domestic sewage, more like dirty dish water than anything else. From nine until eleven o'clock it became quite reddish in color from the large quantity of tannins contained; from eleven until about two in the afternoon, it became whitish, apparently from lime admixture; from then on it usually showed more or less brownish red coloration to about five or six o'clock, when it gradually became cleaner and less colored, so that at nine or ten o'clock at night it became the clearest and least colored of the day, and is said to remain so during the night, when hardly enough to overflow the large septic tank ran over.

In Berlin there is a special surface drainage system, carrying off surface water and storm water.

The four tanneries together give about 150,000 gallons of waste water a day to the sewers. The gas works gives from 12,000 to 15,000 gals. The rubber works sends in about 12,000 to 15,000 gals. per day also. The other factories together give about 20,000 gals. Altogether the factories make up about 200,000 gals., leaving thus about 250,000 gals. of domestic sewage. The population of the town is above 10,000. Not all the town is sewered.

Composition of the Sewage. Thirty-three samples were examined from June 26 to Sept. 4. These were aliquot portions from hourly samples taken at the disposal works from the main sewer, on the days indicated in the subjoined table. These samples were always brown in color except on public holidays and Sundays, and showed considerable sediment from 1-30 to 1-25 of the column. The odor was generally stale and did not vary much. The reaction was never found to be anything but neutral, phenolpthalin, methyl-orange, red and blue litmus being used as indicators. Chemically it showed the subjoined average composition per 100,000 parts: Free ammonia, 2.542; albuminoid ammonia, 2.017; oxygen consumed, 49.95; chlorine, 61.00.

This on passing into Schneider's Creek blackened almost immediately, due to a fine precipitation of tannates, etc. This precipitate was found to be soluble in hydrochloric acid and to then show a distinct iron reaction with potassium thyocyanate. The water above the sewage farm in Schneider's Creek showed iron to be present. Any of the ground waters about the disposal plant and anywhere else about Berlin that were taken showed iron. Any of the sewage that had run through the town beds showed distinct blackening. None of that from our beds showed it until after some weeks of sewage application. No sewage coming from the septic tanks even showed any appreciable amount of blackening.

Water of Schneider's Creek. During the comparatively dry times the flow of this creek showed about 1,000,000 gals. per 24 hours. Above the sewage disposal plant the water was nearly clear, and showed the following chemical composition per 100,000 parts: Free ammonia, .035; alb. ammonia, .045; oxygen consumed, 3.5; chlorine, 1.0. Below the plant it was invariably blackish in color, sometimes very black and showed the following composition per 100,000 parts: Free ammonia, .875; alb. ammonia, .225; oxygen con., 62.0; chlorine, 18.0.

Raw Sewage at Berlin.

(Parts in 100,000.)

1902.	Total free ammonia.	Total albumenoid ammonia.	Oxygen consumed.	Chlorine.	Color.
June 26th	3.000	1.500	31.50	....	Red.
" 28th	3.450	1.890	16.90	....	"
" 30th	3.885	2.856	69.80	....	"
July 1st	4.788	4.410	27.43	....	"
" 2nd	2.772	1.092	22.37	....	Greyish.*
" 3rd	3.780	3.024	43.40	....	Red.
" 5th	2.520	2.590	21.50	....	No Color.
" 8th	2.100	2.016	63.00	....	Red.
" 9th	1.620	1.600	49.70	....	Little Color.
" 11th	1.640	1.320	66.20	....	Red.
" 12th	1.960	1.680	51.00	....	"
" 15th	2.530	2.560	49.80	30.0	"
" 16th	2.120	1.460	56.10	86.0	"
" 19th	2.220	1.900	58.60	40.0	"
" 23rd	2.660	2.280	28.40	88.0	"
" 29th	1.360	1.310	52.90	....	"
Aug. 8th	2.400	1.450	43.40	....	"
" 9th	2.300	1.450	55.80	....	"
" 15th	2.600	2.600	....	....	"
" 16th	2.600	2.300	....	....	"
" 19th	2.325	1.600	....	....	"
" 20th	2.100	1.650	40.80	....	"
" 21st	2.450	1.750	78.80	....	"
" 22nd	2.225	2.250	54.80	....	"
" 23rd	2.475	2.025	72.80	....	"
" 26th	2.700	2.700	49.00	... .	"
" 27th	2.675	1.660	59.60	....	"
" 28th	2.925	1.625	52.40	....	"
" 29th	2.150	1.925	85.80	....	"
" 30th	2.750	2.200	45.80	....	"
Sept. 2nd	1.900	2.050	....	....	"
" 3rd	2.800	2.100	....	....	"
" 4th	2.100	1.750	....	....	"
Averages	2.542	2.017	49.95	61.0	....

*Public Holiday.

Uptown Septic Tanks. These tanks (two of them) were placed one above the gas works, the other below, for the purpose of finding if the effluent of the works acted harmfully towards bacterial growth and might thus hinder the treatment of Berlin's sewage. They were started on May 27th. The experiment ceased September 18th.

These tanks were each of 600 gallons capacity, containing a depth of three feet of sewage and being four feet wide. They were each divided into four equal parts by baffle boards dropping down from above and extending up from below, leaving a space between them of about six inches, the space being about one foot below the surface of the sewage and extending all the way across the tank, with the object of holding the sludge at the bottom and the scum above, at the same time allowing the current to run through continuously with little disturbing influence. The rate of flow was about 1,200 gallons per 24 hours for each tank. During the experiment the first compartment, half of the second and about one inch of the bottom of the third filled with sludge. The odor was never bad. Bubbling was always sluggish, and did not commence until June 28th (season was cool), and with the exception of the first compartment the scum was not marked. There was practically no difference in appearance between the two tanks, except that the color below the gas works always seemed better, probably accounted for by the dilution.

From seven a.m. until six p.m., when samples were collected, half hour quantities of affluent and effluent were taken and kept separate. Of these aliquot portions were taken for examination. And in making the examination it was made on unfiltered specimens.

The tank above the gas work removed 40 per cent. of the albuminoid substance and 22.97 of the oxygen consuming material, whilst that below there removed 38.5 per cent of the albuminoid and 38.4 per cent. of the oxygen consuming substances. The sewage entering the upper tank was not so diluted as that below, but on the whole the difference is small when allowance is made for difference in affluent, but that difference is in favor of the upper tank, in the albuminoid substances, the more important of the constituents of the sewage. The difference though shows that the gas works effluent is not favorable, but that it is not unfavorable to any great extent. The sewage containing it is treatable bacterially at least by anaerobes. The following tables will show the composition of the affluents and effluents for each tank. The averages of these speak for themselves.

Part of the change in both the upper and lower tanks was bacterial. There was little effect of the gas works effluent on this, of course sedimentation played its part too.

SEPTIC TANK ABOVE GAS WORKS.

(Parts in 100,000.)

1902.	Affluent.			1902.	Effluent.		
	Free ammon.	Alb. ammon.	Oxygen consumed.		Free ammon.	Alb. ammon.	Oxygen consumed.
June 27th	3.465	1.890	16.79	June 27th	3.570	2.380	16.43
" 28th	3.360	2.520	....	" 28th	2.835	1.470	....
" 30th	3.885	2 856	69.80	" 30th	3.150	1.686	64.90
July 1st	4.788	4.410	27.43	July 1st.	4.620	2.268	15.90
" 3rd	3.780	3.024	43.40	" 3rd	2.940	1.590	28 50
" 5th	2.520	2.590	21.50	" 5th	3.150	2.180	12 30
Sept. 18th	....	2.950	....	Sept. 18th	....	1.100	....
" 19th	2.850	3.025	....	" 19th	3.250	1.650	....
" 25th	1.850	1.625	....	" 25th	2.150	0.925	....
" 26th	....	2.050	....	" 26th	....	.900	....
Averages	3.312	2.694	35.78	Averages	3.205	1.614	27.60

Change in color throughout.
Capacity of tank 600, run at rate of 1,200 gallons per 24 hours.

SEPTIC TANK BELOW GAS WORKS.

(Parts in 100,000.)

1902.	Affluent.			1902.	Effluent.		
	Free ammon.	Alb. ammon.	Oxygen consumed.		Free ammon.	Alb. ammon.	Oxygen consumed.
June 27th	3.045	1.417	18.95	June 27th	3.156	1.417	12.24
" 28th	3.780	1.995	....	" 28th	....	....	....
" 30th	2.940	2.782	37.50	" 30th	2.410	1.260	32.20
July 1st	3.150	2.856	23.46	July 1st	3.570	1.848	16.60
" 3rd	2.360	2.688	40.20	" 3rd	2.520	1.512	14.80
" 5th	2.390	2.590	16.70	" 5th	2.520	1.340	8.50
Sept. 18th	....	2.075	....	Sept. 18th	....	1.275	....
" 19th	2.925	1.400	....	" 19th	2.850	1.375	....
" 26th	....	2.300	....	" 26th	....	.950	....
Averages	3.084	2.231	27.36	Averages	2.837	1.372	16.86

Reduction of color always.

Capacity of tank 600 gallons, running at rate of 1,200 gallons per 24 hours.

RESULTS IN THE SEPTIC TANKS, AT THE FARM.

In conducting these experiments two tanks were used: one, the tank two years before constructed by the town, with a total capacity of 60,000 gallons, the other one of 1,800 gallons capacity. The smaller tank was a duplicate of the same construction as those uptown in construction and division of compartments, and with the same arrangements of baffle boards. The larger one, as may be seen by the subjoined print, had baffle boards running down from the surface only. The baffling in the small tank was much more successful in arresting suspended matter than that in the large tank, even when making allowance for the difference in flow. The sludge in the smaller tank filled the first chamber and about one foot of the second. There was not more than an inch or two of it in the third. In the large tank all of the grit or first chamber was filled, the proximal floor of the rest did not show more than about 6 or 8 inches of sediment. Both tanks were started on June 26th, the experiments with them ceased on Sept. 4th, when these sludge measurements were made.

The flow through the small tank was continuous, and at the rate of 1,800 gallons per day throughout the experiment. The following table will show the average affluent with the effluent date by date, with the general average of each at the end of the experiment. The average percentage treatment here was for albuminoid substances 53.0, and for oxygen consuming materials, 51.7.

This occurred curiously enough without the production of any unpleasant odor. The gas production was never extremely vigorous, nor was scum formation marked, but compared with the affluent the effluent had lost a considerable quantity, as much as 3-4 of its coloring matter:

SMALL SEPTIC TANK AT FARM.

(Parts in 100,000.)

1902	Affluent.			1902.	Effluent.		
	Free ammon.	Alb. ammon.	Oxygen consumed.		Free ammon.	Alb. ammon.	Oxygen consumed.
June 26th	3.000	1.500	31.50	June 26th	2.500	1.062	11.74
July 8th	2.100	2.016	63.00	July 8th	1.785	1.210	42.80
" 9th	1.620	1.600	49.70	" 9th	.850	.880	19.80
" 11th	1.640	1.320	66.20	" 11th	.850	.840	22.10
" 16th	2.120	1.460	56.10	" 16th	1.180	.740	21.90
" 29th	1.360	1.310	52.90	" 29th	1.620	1.250	31.60
Aug. 8th	2.400	1.450	43.45	Aug. 8th	2.800	1.150	28.40
" 9th	2.300	1.450	55.80	" 9th	3.000	.750	13.20
" 15th	2.600	2.600	....	" 15th	2.400	1.000	....
" 16th	2.600	2.300	....	" 16th	1.500	.575	....
" 19th	2.325	1.600	....	" 19th	2.050	.675	....
" 20th	2.100	1.650	40.80	" 20th	2.075	.975	32.00
" 21st	2.450	1.750	78.80	" 21st	2.350	1.150	23.60
" 22nd	2.225	2.250	56.80	" 22nd	1.375	.760	39.60
" 23rd	2.475	2.025	72.80	" 23rd	1.705	.700	29.60
" 26th	2.700	2.700	49.00	" 26th	2.075	1.025	30.20
" 27th	2.675	1.600	59.60	" 27th	1.800	1.050	20.20
" 28th	2.925	1.625	52.40	" 28th	2.125	.975	37.20
" 29th	2.150	1.925	85.80	" 29th	1.825	.850	30.80
" 30th	2.750	2.200	45.80	" 30th	2.100	.925	33.80
Sept. 2nd	1.900	2.050	....	Sept. 2nd	2.550	.550	....
" 3rd	2.800	2.100	....	" 3rd	2.450	.800	....
" 4th	2.100	1.700	....	" 3th	2.475	1.050	....
Averages ..	2.317	1.835	57 08	Averages ..	1.966	.860	27.56

Capacity 1.800 gallons. 1,800 gallons run through per 24 hours.

THE LARGE SEPTIC TANK.

The large septic tank had just been emptied of sludge when the experiment began. It did not show any advantage over the smaller one in the time of commencing treatment. Bubbles appeared on both about the same time after the warm weather began. Seeding here, apparently, at least, had no advantage. Of course there must be taken into account the much larger bulk of sewage. The resting place for the bacteria being the surfaces of the tank and the contained sludge, the fluid moving out rapidly gave them much less chance to perform their work. This tank, whose capacity was 60,000 gallons, was run at the rate of 100,000 gallons per 24 hours. There was no odor. The removal of color was never as good as in the smaller tank, and there was always more suspended matter in its effluent than in the smaller tank. The bubbling was about the same in both. There was very little scum—hardly as much as in the smaller tank.

In the following table will be found the chemical composition of the affluents and effluents throughout the experiment. The average percentage treatment here was albuminoid substances, 45.5, and for oxygen consuming substances, 40.6.

Large Septic Tank at Farm.

(Parts per 100,000.)

1902.	Affluent.			1902.	Effluent.		
	Free ammon.	Alb. ammon.	Oxygen consumed.		Free ammon.	Alb. ammon.	Oxygen consumed.
June 26th	3.000	1.500	31.50	June 26th	3.000	1.375	10.45
July 3rd	....	....	....	July 3rd	2.940	1.260	19.47
" 8th	2.100	2.016	63.00	" 8th	1.800	1.176	47.10
" 9th	1.620	1.600	49.70	" 9th	1.357	.874	18.50
" 11th	1.640	1.320	66.20	" 11th	1.270	.864	16.20
" 12th	1.960	1.680	51.00	" 12th	1.160	1.190	53.70
" 15th	2.530	2.560	49.80	" 15th	1.820	1.260	40.40
" 19th	2.220	1.900	58.60	" 19th	2.240	1.240	38.30
" 23rd	2.660	2.280	28.40	" 23rd	2.140	1.160	25.00
" 29th	1.360	1.310	52.90	" 29th	.980	.728	21.00
Aug. 8th	2.400	1.450	43.40	Aug. 8th	2.450	.950	28.60
" 9th	2.300	1.450	55.80	" 9th	1.900	.650	26.60
" 15th	2.600	2.600	....	" 15th	2.100	1.350	....
" 16th	2.600	2.300	....	" 16th	2.200	.950	....
" 19th	2.325	1.600	....	" 19th	2.975	1.050	....
" 20th	2.100	1.650	40.80	" 20th	2.250	1.175	28.80
" 21st	2.450	1.750	78.80	" 21st	2.475	1.125	39.10
" 22nd	2.225	2.250	54.80	" 22nd	1.750	1.265	49.00
" 23rd	2.475	2.025	72.80	" 23rd	2.175	.950	36.80
" 26th	2.700	2.700	49.00	" 26th	2.650	.925	49.75
" 27th	2.675	1.600	59.60	" 27th	2.650	1.150	32.00
" 28th	2.925	1.625	52.40	" 28th	2.650	1.100	36.60
" 29th	2.150	1.925	85.80	" 29th	2.250	1.025	34.00
" 30th	2.750	2.200	45.80	" 30th	2.900	1.025	28.60
Sept. 2nd	1.900	2.050	....	Sept. 2nd	3.250	.925	....
" 3rd	2.800	2.100	....	" 3rd	3.050	.775	....
" 4th	2.100	1.750	....	" 4th	2.250	.925	....
Averages	2.329	1.939	54.48	Averages	2.223	1.057	32.37

Capacity, 60,000 gallons. 100,000 gallons run through each 24 hours.

There is thus a difference of 7.5 per cent. in the removal of albuminoid subtsance and 10.1 per cent. of oxygen consuming material in favor of not running a septic tank at Berlin above its capacity for the 24 hours. It would seem enough to repay the outlay made in supplying more tankage capacity.

The treatment obtained in both these tanks shows that septic tank treatment here is very well up to the best obtained at other places. The advantage in our experiments here was that both tanks were large, especially the larger one, and we were able to get results more clearly approaching what might be expected in the practical disposal of sewage.

Contact Beds.

There were four of them. Three of these had contact material of gravel and were covered to a depth of 3 inches with a coarse, sharp sand to screen affluent. The gravel in each of the three beds was of different sizes. This was done with the idea of seeing what difference size of material would have in the treatment obtained. The gravel was screened quite clear of sand and dirt of any kind. It was placed in each bed in a three-foot deep layer, the bottom of the bed being underdrained with 4 inch tile, coarse gravel being placed around the tile in a layer about 2 inches thick. These three beds had each an area equal to one-hundredth of an acre. The banks and bottom of the beds were of clay, fortunately found in situ: any sandy seams present were dug out and tamped well with clay to prevent leakage. Boxes with sliding gates were placed to control the effluents. These three beds were finished and started on July 8th, the experiment with them was continued until Sept. 4th. It was nearly two weeks after starting before they commenced to remove the tannin color of the affluent, which had been always in the effluent of the large septic tank.

The bed with the smallest material was the first to change the tannins and always did it best, the least efficient of the beds being that with the coarsest gravel. In the effluent of this last there was always left a certain tannin coloration. Consultation of the subjoined tables will show the interspace capacity of each bed, the rate at which run and the composition of the affluent and the effluent from date to date and at the end the averages of each. At no time was the effluent from any of these beds non-putrescible. The bed with the finest gravel gave always the best effluent, the coarsest the least treated, though the nitrate results were best in he coarsest bed when they were made.

During the first part of the experiment the beds were filled 3 times each day, during the second period only twice a day. It will be noted in the tables that there is no appreciable dfference in the results of the treatment, whether two or three applications a day were made. The sand on the surface of the beds had to be raked over every few days otherwise it was found that the sewage could not go down into the beds. In collecting the samples, the affluents were sampled three times whilst running on, the effluents were taken three times whilst running off. The results from the three cycles or two as the case might be, were mixed together, affluent with affluent, effluent with effluent and aliquot portions taken for examination.

The interspace capacity of all the beds was probably reduced during the experiment. No. 1 showed a reduction of one-eleventh. It was the only one measured.

The percentage reduction in each bed over affluent was:

	Free ammonia.	Albuminoid ammonia.	Oxygen consumed.
No. 1............	40 per cent.	34.4 per cent.	51 per cent.
No. 2............	30.3 "	42.3 "	51.7 "
No. 3............	33.6 "	27.8 "	44.5 "

The best bed leaves an average effluent showing per 100,000 parts:

Free ammonia.	Albuminoid ammonia.	Oxygen compound.
1.562	.592	16.43

Thus there is shown a percentage reduction from the crude sewage of:

Free ammonia.	Albuminoid.	Oxygen compound.
32.8 per cent.	68.8 per cent.	70.3 per cent.

The septic tank has done more than two-thirds of the work.

Contact Bed I.

1/200 acre. (Parts per 100,000.) Quarter inch gravel.

1902.	Affluent.			1902.	Effluent.		
	Total free ammon.	Total alb. ammon.	Oxygen consumed.		Total free ammon.	Total alb. ammon.	Oxygen consumed.
July 8th	1.785	1.210	42.80	July 8th	1.260	.630	24.00
“ 16th	1.180	.740	21.90	“ 16th	.760	.670	14.90
“ 23rd	2.140	1.160	25.00	“ 23rd	.530	.640	8.70
“ 29th	1.300	1.039	26.30	“ 29th	1.330	.490	27.00
Aug. 8th	2.450	.950	28.60	Aug. 8th	1.400	.650	10.40
“ 9th	1.900	.650	26.60	“ 9th	.900	.350	11.20
“ 15th	2.100	1.350	....	“ 15th	1.700	.825	....
“ 16th	2.200	.950	....	“ 16th	1.525	.550	....
“ 19th	2.975	1.050	....	“ 19th	2.250	.600	....
“ 20th	2.250	1.175	28.80	“ 20th	1.475	.700	29.30
“ 21st	2.475	1.125	39.10	“ 21st	1.200	1.100	14.20
“ 22nd	1.750	1.265	49.00	“ 22nd	.950	.555	17.60
“ 23rd	2.175	.950	36.80	“ 23rd	.965	.500	14.60
“ 26th	2.650	.925	49.75	“ 26th	1.525	.775	15.00
“ 27th	2.650	1.150	32.00	“ 27th	1.325	.575	12.40
“ 28th	2.650	1.100	36.60	“ 28th	1.275	.575	12.40
“ 29th	2.250	1.025	34.00	“ 29th	1.575	.550	20.40
“ 30th	2.900	1.025	28.60	“ 30th	....	....	....
Sept. 2nd	3.250	.925	....	Sept. 2nd	2.400	.450	....
“ 3rd	3.050	.775	....	“ 3rd	1.950	.500	....
“ 4th	2.252	.925	....	“ 4th	1.375	.675	....
Averages	2.306	1.022	33.72	Averages	1.383	.678	16.59

Interspace capacity 234,400 gals. per acre. Run at three times this rate for first half of experiment per acre per day. Run at twice this rate for second half of experiment per acre per day.

Contact Bed II.

1/200 acre. (Parts per 100,000.) One-eighth inch gravel.

1902.	Affluent.			1902.	Effluent.		
	Total free ammon.	Total alb. ammon.	Oxygen consumed.		Total free ammon.	Total alb. ammon.	Oxygen consumed.
July 8th	1.800	1.176	47.10	July 8th	1.470	.580	19.70
" 15th	1.820	1.260	40.40	" 15th	.960	.460	9.10
" 16th	1.800	1.206	40.04	" 16th	.660	.560	12.10
" 19th	2.240	1.240	38.30	" 19th	.640	.680	18.60
" 23rd	2.140	1.160	25.00	" 23rd	.780	.800	9.20
" 29th	.980	.728	21.00	" 29th	.730	.500	26.80
Aug. 8th	2.450	.950	28.60	Aug. 8th	1.400	.650	11.60
" 9th	1.900	.650	26.60	" 9th	.900	.300	8.00
" 15th	2.100	1.350	....	" 15th	2.200	.900	....
" 16th	2.200	.950	....	" 16th	2.150	.575	....
" 19th	2.975	1.050	....	" 19th	2.925	.800	....
" 20th	2.250	1.175	28.80	" 20th	1.725	.475	28.70
" 21st	2.475	1.125	39.10	" 21st	1.475	.660	15.20
" 22nd	1.750	1.265	49.00	" 22nd	1.150	....	21.00
" 23rd	2.175	.950	36.80	" 23rd	1.170	.500	....
" 26th	2.650	.925	49.75	" 26th	1.725	.700	18.50
" 27th	2.650	1.150	32.00	" 27th	1.475	.650	11.60
" 28th	2.650	1.100	36.60	" 28th	1.475	.525	12.60
" 29th	2.250	1.025	34.00	" 29th	1.675	.575	17.60
" 30th	2.900	1.025	28.60	" 30th	2.050	.575	22.60
Sept. 2nd	3.250	.925	....	Sept. 2nd	2.650	.450	....
" 3rd	3.050	.775	....	" 3rd	2.800	.550	....
" 4th	2.250	.925	....	" 4th	1.750	.650	....
Averages ..	2.247	1.042	34.21	Averages ..	1.562	.596	16.43

Interspace capacity, 187,400 gals. per acre. Run at three times this rate for first half of experiment per acre per day. Run at twice this rate for second half of experiment per acre per day.

Contact Bed III.

1/200 acre. (Parts per 100,000.) One-half inch gravel.

1902.	Affluent.			1902.	Effluent.		
	Total free ammon.	Total alb. ammon.	Oxygen consumed.		Total free ammon.	Total alb. ammon.	Oxygen consumed.
July 8th	1.800	1.176	47.10	July 8th	1.680	.610	19.10
" 12th	1.160	1.190	53.70	" 12th	.300	.740	26.50
" 15th	1.820	1.260	40.40	" 15th	1.260	.620	17.20
" 19th	2.240	1.240	38.30	" 19th	1.090	1.000	25.90
" 23rd	2.140	1.160	25.00	" 23rd	1.340	.960	15.90
" 29th	.980	.728	21.00	" 29th	1.320	.880	51.30
Aug. 8th	2.450	.950	28.60	Aug. 8th	1.700	.650	10.60
" 9th	1.900	.650	26.60	" 9th	1.000	.350	17.40
" 15th	2.100	1.350	....	" 15th	1.650	.925	....
" 16th	2.200	.950	....	" 16th	1.650	.575	....
" 19th	2.975	1.050	....	" 19th	2.100	1.725	....
" 20th	2.250	1.175	28.80	" 20th	1.425	.575	26.30
" 21st	2.475	1.125	39.10	" 21st	1.425	.825	21.00
" 22nd	1.750	1.265	49.00	" 22nd	1.360	.805	20.00
" 23rd	2.175	.950	36.80	" 23rd	1.225	.750	....
" 26th	2.650	.925	49.75	" 26th	1.150	.650	13.00
" 27th	2.650	1.150	32.00	" 27th	1.350	.700	11.60
" 28th	2.650	1.100	36.60	" 28th	1.400	.800	14.40
" 29th	2.250	1.025	34.00	" 29th	1.700	.675	20.40
" 30th	2.900	1.025	28.60	" 30th	1.975	.700	10.60
Sept. 2nd	3.250	.925	....	Sept. 2nd	2.150	.575	....
" 3rd	3.050	.775	....	" 3rd	2.400	.600	....
" 4th	2.250	.925	....	" 4th	2.200	.850	....
Averages	2.262	1.041	36.19	Averages	1.502	.758	20.07

Interspace capacity, 257,800 gallons per acre.
Run at three times this rate for first half of experiment, per acre per day.
Run at twice this rate for second half of experiment, per acre per day.

COKE CONTACT BED.

This was of the same depth as the gravel beds and was constructed and drained in the same way. The coke was of a specially hard form in pieces of 1 inch in size. It had an area of one-eight hundredth of an area. It was finished and started on August 8th, and finished with on September 4th. It took a week's working before its effluent showed any reduction of the color of the affluent. The effluent as shown by the subjoined table was not satisfactory. Its interspace capacity was 356,000 gallons per acre, and it was run at the rate of 712,000 gallons per acre per day.

During the week beginning September 15, we tried reapplying the effluent of this bed to it again having pumped it into barrels. Curiously, the second effluents showed more albuminoid ammonia than the first effluent, very like what happened continuously with the Stoddart continuous filter.

Coke Bed.

(Parts per 100,000.)

1902.	Affluent.			1902.	Effluent.		
	Free ammon.	Alb. ammon.	Oxygen consumed.		Free ammon.	Alb. ammon.	Oxygen consumed.
Aug. 8th	2.800	1.150	28.40	Aug. 8th	2.500	.850	22.00
“ 9th	3.000	.750	13.20	“ 9th	1.700	.600	49.00
“ 15th	2.100	1.350	....	“ 15th	2.250	1.150	....
“ 16th	2.200	.950	....	“ 16th	2.050	.750	....
“ 19th	2.975	1.050	....	“ 19th	2.550	.975	....
“ 20th	2.250	1.175	28.80	“ 20th	1.950	1.000	12.20
“ 21st	2.475	1.125	39.10	“ 21st	1.900	.925	24.60
“ 22nd.......	1.750	1.265	49.00	“ 22nd.......	1.975	1.200	39.20
“ 23rd	2.175	.950	36.80	“ 23rd	1.700	.725	....
“ 26th	2.650	.925	49.75	“ 26th	2.625	1.050	24.50
“ 27th	2.650	1.150	32 00	“ 27th	1.775	1.125	53.80
“ 28th	2.650	1.100	36.60	“ 28th	2.625	1.125	29.40
“ 29th	2.250	1.025	34.00	“ 29th	2.150	.975	22.40
“ 30th	2.900	1.025	28.60	“ 30th	2.900	1.025	15.20
Sept. 2nd.......	3.250	.925	....	Sept. 2nd.......	3.000	.850	....
“ 3rd	3.050	.775	....	“ 3rd	3.400	.600	....
“ 4th	2.250	.925	....	“ 4th	2.425	1.000	....
Averages....	2.551	1.036	33.27	Averages....	2.327	.936	29.23

Interspace capacity, per acre, 356,000 gallons. Run at the rate of 712,000 gallons per acre per day.

Stoddart Continuous Filter. This bed was made of 2 sq. yards area, 4 feet deep of well washed coarse 3 inch hard clinkers, placed on a sloping board foundation, with no walls, except the back one. It was fed with septic sewage from the large septic tank continuously in a rain by an imitation of Stoddart's distributor. Drawings of the bed may be seen by referring to the accompanying sealed sketch of the experimental plant at the disposal farm. The sewage was poured on this at the rate of 5,000,000 gallons per acre per day. The color was rendered black and instead of a fine precipitate as was in affluent, a flocculent one came away with the effluent. The odor about the bed was decidedly offensive. A large growth of low vegetable matter, but not enough to obstruct the bed, soon took possession.

The effluent showed more albuminoid ammonia than went into it. A Kjeldahl estimation showed a decrease in the organic nitrogen coming off to that going on, this might possibly be the origin of the increased albuminoid ammonia, the rest having gone off in gases.

In appearance the effluent was certainly changed. It was still putrescible though; but it had lost its tannin color, and after settling showed a pretty clear supernatant fluid. The following table will show what was done in this bed: Sedimenation after passage through should give an advantageous result.

STODDARD CONTINUOUS FILTER.

(Parts per 100,000.)

1902.	Affluent.			1902.	Effluent.		
	Free ammon.	Alb. ammon.	Oxygen consumed.		Free ammon.	Alb. ammon.	Oxygen consumed.
Aug. 8th	2.450	.950	28.60	Aug. 8th	2.000	.950	35.60
“ 9th	1.900	.650	26.60	“ 9th	1.700	1.150	22.40
“ 15th	2.100	1.350	....	“ 15th	2.400	1.350	....
“ 16th	2.200	.950	....	“ 16th	2.400	1.150	....
“ 19th	2.975	1.050	....	“ 19th	3.300	1.550	....
“ 20th	2.500	1.400	10.00	“ 20th	2.275	.925	13.30
“ 21st	2.875	1.000	34.80	“ 21st	2.100	1.350	30.40
“ 22nd	1.750	1.250	49.00	“ 22nd	1.875	1.350	32.00
“ 23rd	2.150	1.300	....	“ 23rd	2.150	.900	....
“ 26th	2.850	1.125	29.50	“ 26th	2.550	1.550	23.50
“ 27th	2.650	1.150	32.00	“ 27th	1.675	.925	27.40
“ 28th	2.650	1.100	36.60	“ 28th	2.200	1.200	27.80
“ 29th	2.550	1.100	36.00	“ 29th	2.100	1.650	32.80
“ 30th	3.000	1.125	42.00	“ 30th	2.000	1.500	46.00
Sept. 2nd	3.050	.750	....	Sept. 2nd	2.350	.675	....
“ 3rd	3.050	.800	....	“ 3rd	1.550	1.025	....
“ 4th	2.450	1.125	....	“ 4th	2.050	1.150	....
Averages....	2.538	1.069	30.52	Averages	2.151	1.191	29.12

Run at rate of 5,000,000 gallons per 24 hours per acre.

Town Bed.

July 15th........	1.820	1.260	40.40	July 15th........	1.350	.400	12.80

Sand in Neighborhood of Farm. The hills in the neighborhood of the farm were visited from time to time in order to determine their composition. Test holes were dug in several places. Sand of an excellent quality was found both in the east and the west of the sewage farm. At a very small depth below the surface not more than from eighteen to twenty-five inches and usually much less. In several of the holes a thin stratum of sandy clay about half an inch thick was found at about 20 inches below the surface of the sand in the hills to the west, but only very few such spots were found in hills to the east of the farm. The sand to the east is decidedly the better. On the surface it seems very fine, but after a few inches is quite coarse and sharp. This clay stratum might hinder free aeration of the beds if they should be constructed there.

Many acres more than sufficient to treat twice Berlin's present sewage could be made into beds on these hills.

Tannery Waste. The whole day effluent from the harness leather tannery was examined on five occasions and gave the following average composition per 100,000: Free ammonia, 3.20; albuminoid ammonia, 5.25; oxygen consumed, 122.4. By using an experimental sedimentation by means of two 40 gallon garrels, baffled after the metallurgists' principle, viz., allowing the fluid to enter into a small narrow chamber open at the bottom and leading into a much larger one, the solids rising against the head of water, are more likely to remain at the bottom, from this first barrel the effluent overflowing into a second divided in the same way. The average effluent was as follows in parts per 100,000: Free ammonia, 2.183; albuminoid ammonia, 3.15; oxygen consumed, 111.0, thus showing a reduction of 40 per cent. in the albuminoid substances by a mere sedimentation process allowing the compounds to react on one another, in a simple retention space. The oxygen consuming materials did not show the same or any considerable reduction at all, though the comparative colors of affluent and effluent showed a decided reduction in favor of the effluent.

By using alum on the tannin liquor before allowing it to enter the general mixture with 15 grains of alum to each gallon of liquor an almost complete removal of tannins could be made, with besides an additional reduction of albuminoid substances to the extent of 10.12 per cent. Sulphate of iron gave the same result, but had the disadvantage of producing an objectionable black color in the effluent.

Conclusions Based on Experiments Regarding Berlin's Sewage Disposal Problem.

The average sewage of Berlin shows per 100,000 parts:

Free ammonia.	Albuminoid ammonia.	Oxygen consumed.
2.542	2.017	49.95

The average large septic tank effluent, 60,000 gallons capacity, treating 100,000 gallons per day, shows:

Free ammonia.	Albuminoid ammonia.	Oxygen consumed.
2.223	1.057	32.37

The average small septic tank effluent, 1,800 gals. capacity, treating 1,800 gals. per day, shows:

Free ammonia.	Albuminoid ammonia.	Oxygen consumed.
1.966	.860	27.56

The average of the bed giving best results on treating 562,000 gals. per acre per day shows an effluent containing:

Free ammonia.	Albuminoid ammonia.	Oxygen consumed.
1.562	.596	16.43

A good water should approach the following composition:

Free ammonia.	Albuminoid ammonia.	Oxygen consumed.
.003	.005	.115

A water from peaty soils may contain:

Free ammonia.	Albuminoid ammonia.	Oxygen consumed.
.005	.023	.740

In a stream diluting 3 times a sewage effluent containing:

Free ammonia.	Albuminoid ammonia.	Oxygen consumed.
.015	.069	2.220

Might be allowed to enter.

Into a stream diluting 10 times, a sewage effluent containing:

Free ammonia.	Albuminoid ammonia.	Oxygen consumed.
.05	.23	7.400

Might be allowed to enter.

The combined result of septic and the best bed treatment gives a sewage 4 times too strong to enter Schneider's Creek.

The gas works effluent (gas being made from petroleum), after removal of the tarry products, may be discharged into the sewers.

The tarry material if allowed to enter would render any bacterial oxidation beds useless. Settling tanks, on the gas premises, baffled at bottom and surface, with a capacity of at least a half day's sewage, would hold this back. A small side tank of the same construction should be present to treat it whilst the larger is being cleaned.

The tanneries yield considerable organic matter that could be held back, to as large an extent as 40 per cent. with tank settling capacity equal to the 24 hours' sewage flow.

Schneider's Creek which receives the effluent, is very small, having a dry weather capacity of probably not more than 1,000,000 gallons a day. There is not enough water to dilute the effluent given by septic tanks and contact beds to the recognized standard of a tolerated drinking water.

Enough sandy land to give intermittent sand filtration to all Berlin's sewage for the present and probably years to come can be got in the immediate vicinity of the farm.

To reach such sand pumping would be required. A reservoir to hold the whole 24 hours' sewage could be constructed. In this way all the pumping could be done in a few hours.

Septic tanks as an auxiliary could be used in connection with this intermittent sand filtration to reduce the quantity of organic matter to be treated and to the extent of work done would reduce the quantity of land required to purify the sewage to the required standard.

Were such a sand filtration method adopted, the septic tank capacity for the present sewage flow should not be less than 450,000 gallons.

On such sand beds as could be got at Berlin sand filtration elsewhere gives an effluent equal to the required standard.

Extracts from the Fourth Quarterly Report of the Laboratory of the Provincial Board of Health, 1906.

Results of the working of the first year of the completed Sewage Disposal Plant at Berlin, Ont.

The plant was finally completed early in January of 1906, and consists of the following parts:

1. Two septic tanks of a combined capacity of 472,500 gallons.
2. A storage reservoir (to accommodate to pumping time) of same capacity as the work of the plant increases half of the reservoir can be used as a

septic tank and finally the last half of it should become necessary later on again.

3. Two electrically propelled centrifugal pumps to lift the sewage 60 feet to

4. Fourteen acres of underdrained and graded "Intermittent sand Filtration" beds.

The operation of the completed plant was begun in January, 1906, without the beds having been ridged up and whilst the filter material was frozen. Some weeks of exceptionally mild weather resulted in the thawing out of the beds but they afterwards froze up again. In spite of all this they gave a more putrescible effluent from the very start and a clear sparkling water and have continued to do so up to the present time, without giving rise to any nuisance in the neighborhood. Schneider's Creek is now clear and no longer a nuisance as it was for years.

The whole plant as constructed under the direction of Mr. Mahlon Davis was a model when completed and if properly handled should give continued good results. It, however, won't run itself, and for a greater part of this summer it was undermanned. At Dr. Hodgetts' and my visit some weeks ago, it was already showing the effects of neglect—overgrowth of weeds, breaking down of embankment, blowing about of the sand, upturning of some of the tile, sinking from flooding in one of the beds and accumulation of sludge on some of them.

Since February 2nd, 1906, average samples of the raw, septic and filtered sewages have been furnished us by Mr. Davis for analysis.

Appended are tables showing the composition of each of the samples and sets of samples.

No deterioration has been found, on the contrary the work done is better and better as time goes on.

Date 1906	Raw sewage.				Date 1906	Septic tank.			
	Laboratory Numbers.	Free NH_3.	Alb. Ammonia.	Chlorine.		Laboratory Numbers.	Free NH_3.	Alb. NH_3.	Chlorine.
Feb. 2	644	30.00	25.00	350	Feb. 2	645	22.25	21.25	250
Mar. 10	844	37.75	10.75	210	Mar. 10	845	32.50	5.25	175
" 13	962	43.50	35.00	280	" 13	963	29.50	10.25	280
" 19	1,092	42.75	36.00	225	" 19	1,093	33.50	5.50	170
" 27	1,233	36.50	17.00	325	" 27	1,234	34.75	5.00	155
Apr. 4	1,352	38.00	12.00	310	Apr. 4	1,353	21.50	5.00	890
" 11	1,462	35.25	8.75	490	" 11	1,463	21.50	5.75	540
" 18	1,526	14.25	4.50	50	" 18	1,527	18.25	3.50	120
May 1	1,731	37.50	12.75	240	May 1	1,732	23.00	4.00	140
,, 9	1,853	20.25	9.50	345	" 9	1,854	11.00	4.50	160
,, 30	3,034	20.50	12.25	245	" 22	2,022	22.50	8.75	170
June 6	3,432	27.25	11.75	280	" 30	3,035	17.00	5.00	145
" 14	3,800	23.00	9.50	110	June 6	3,433	26.00	4.75	160
" 26	4,241	42.75	11.25	235	" 14	3,801	23.75	20.75	280
July 5	4,430	14.75	4.25	95	" 26	4,242	27.00	4.50	155
" 11	4,603	22.00	9.50	330	July 5	4,431	31.00	4.25	315
Aug. 22	5,816	16.40	10.40	575	" 11	4,604	25.50	5.50	260
Sept. 26	6,659	26.00	13.00	650	Aug. 22	5,817	18.10	7.00	350
					Sept. 26	6,660	27.00	7.00	430
Average		29.355	14.063	291.3	Average		24.505	7.231	270.8
Per 100,000		2.9355	1.4063	29.13	Per 100,000		2.450	.723	27.08

The plant confirms the experience in other places as to efficiency of the "Intermittent Sand Filtration" method of treating sewage.

The septic tank as an aid or auxiliary to the beds has given good account of itself here. All sewages however, are not like Berlin's.

So much for the Town's sewage disposal plant. The manufacturers of the town have done a good deal to make these good results possible.

The tanners have each put in plants for the preliminary treatment of their waste before discharging into the sewers, and these have been a great benefit.

The brewers have done likewise. The gas-works, not taking the precautions, they were instructed to take, were forbidden the sewers and now discharge into the creek, and will probably be made to answer their action by those affected on the below stream.

Date 1906.	Beds Nos. 1 and 2.				Date 1906.	Beds Nos. 3 and 4.			
	Laboratory Numbers.	Free NH_3.	Alb. NH_3.	Chlorine.		Laboratory Numbers.	Free NH_3.	Alb. NH_3.	Chlorine.
February 2....	641	.50	2.75	160	February 2....	642	10.25	3.50	310
March 10....	846	1.00	2.00	125	March 10....	847	15.25	3.00	190
" 13....	964	2.00	1.25	220	" 13....	965	14.50	4.75	105
" 19....	1,094	2.50	2.25	155	April 18....	1,529	7.75	1.00	200
" 27....	1,235	.50	1.00	145	May 1....	1,734	11.50	.00	210
April 4....	1,345	1.50	2.00	340	" 22....	2,024	6.50	1.00	260
" 18....	1,527	10.25	.50	230	June 6....	3,437	12.50	1.25	290
May 1....	1,733	8.00	.00	200	" 26....	4,244	11.50	1.25	245
" 22....	2,023	9.75	1.25	240	August 22....	5,819	3.70	0.80	243
June 6....	3,436	13.35	1.75	240	September 26....	6,662	4.75	0.50	55
" 26....	4,243	10.35	6.25	230					
August 22....	5,818	3.30	0.90	285					
Septemb'r 26....	6,661	3.25	.50	60					
Average....	......	5.942	1.723	202.3	Average....	......	9.820	1.695	210.8
Per 100.000....	......	.594	.172	20.23			.982	.169	21.08

Date 1906.	Beds Nos. 5 and 6.				Date. 1906.	Beds Nos. 9 and 10.			
	Laboratory Numbers.	Free NH_3.	Alb. NH_3.	Chlorine.		Laboratory Numbers.	Free NH_3.	Alb. NH_3.	Chlorine.
February 2....	643	12.50	2.25	320	March 19....	1,097	2.50	1.75	15
March 10....	848	8.00	2.75	180	" 27....	1,236	1.00	1.50	45
" 13....	966	9.50	2.25	40	April 4....	1,347	1.00	2.00	150
April 18....	1,528	5.50	.75	190	May 1....	1,737	.50	.00	225
May 1....	1,735	4.50	.75	240	" 22....	2,026	6.00	.75	245
" 22 ...	2,025	8.00	1.25	240	June 26....	4,246	3.00	.25	195
June 6....	3,438	9.50	1.25	280	July 5....	4,433	7.00	1.50	190
" 26....	4,245	8.25	.75	200	Aug. 22....	5,822	0.50	0.20	225
July 5....	4,432	13.50	1.25	270	Septemb'r 26....	6,665	6.00	0.50	45
August 22....	5,820	3.30	0.40	270					
Septemb'r 26....	6,663	5.25	1.00	56					
Average....	......	7.98	1.33	207.8	Average....	......	3.05	.93	148.3
Per 100.000....	......	.798	.133	20.78	Per 100,000....	......	.305	.093	14.83

Date. 1906	Beds 8 and 11.			
	Laboratory Nos.	Free, NH_3	Alb. NH_3	Chlorine.
April 4....	1,316	2.50	2.75	280
May 1....	1,736	1.75	.25	205
" 30....	3,029	4.25	.50	210
June 6....	3,439	5.25	1.75	260
July 5....	4,434	16.75	1.25	205
August 22....	5,821	3.60	.60	225
Septemb'r 26....	6,664	6.75	1.00	44
Average	....	5.735	1.159	204
do per 100.000	......	.5735	.1159	20.4

Date. 1906	Bed 15.			
	Laboratory Nos.	Free Ammonia.	Alb. NH_3	Chlorine.
May 30....	3,033	2.50	.50	240
August 22....	5,826	7.70	.80	265
Septemb'r 26....	6,820	.04	.01	18
Average	......	3.413	.437	184.3
do per 100.000	......	.3413	.0437	18.43

Date. 1906	Bed No. 12.			
	Laboratory Nos.	Free NH_3	Alb. NH_3	Chlorine.
April 4....	1,348	.75	2.50	220
" 11....	1,464	.25	1.50	225
May 9....	1,856	2.75	.25	200
" 30....	3,030	2.00	.75	210
June 14....	3,805	4.25	.55	290
July 11....	4,608	1.75	.75	260
August 22....	5,823	0.60	0.10	230
Septemb'r 29....	6,817	0.022	0.005	49
Average	......	1.465	.800	210.5
do per 100.000	......	.146	.080	21.05

Date. 1906	Bed No. 13.			
	Laboratory Nos.	Free NH_3	Alb. NH_3	Chlorine.
April 4....	1,351	1.25	2.50	280
" 11....	1,467	.25	1.75	340
May 9....	1,858	3.00	.25	150
" 30....	3,032	3.25	.75	250
June 14....	3,802	12.00	.35	245
July 11....	4,605	3.50	1.25	260
August 22....	5,827	4.10	0.30	255
Septemb'r 26....	6,818	.025	.007	46
Average	......	3.42	.894	228.2
do per 100.000	......	.342	.089	22.82

Date. 1906.	Bed No. 14.			
	Laboratory Nos.	Free NH_3	Alb. NH_3	Chlorine.
Mar. 19.......	1,095	2.50	2.50	140
" 27.......	1,237	1.25	1.00	85
April 4.......	1,349	.50	2.50	250
" 11.......	1,465	.75	1.25	240
June 14.......	3,804	10.50	.65	230
July 11......	4,607	1.50	.75	220
Aug. 22.......	5,824	6.30	.30	250
Sept. 29.......	6,819	.017	.012	56
Average		2.914	1.180	183.7
Per 100.000...		.291	.118	18.37

Date. 1906.	Bed No. 16.			
	Laboratory Nos.	Free NH_3	Alb. NH_3	Chlorine.
Mar. 13.......	967	3.00	4.25	10
" 27.......	1,238	1.25	1.50	145
April 4.......	1,350	10.75	2.50	460
" 11.......	1,466	11.25	1.50	500
May 9.......	1,857	36.00	.45	250
" 30.......	3,031	8.75	1.00	230
June 14.......	3,803	38.00	.50	260
July 11.......	1,606	6.00	1.25	290
Aug. 22.......	5,825	2.60	.20	245
Sept. 29.......	6,821	.012	.005	54
Average		11.161	1.315	244.4
Per 100.000...		1.176	.131	24.44

In parts per 100.000.

Description.	Number of specimens of each examined.	Free Ammonia.	Albumenoid Ammonia.	Chlorine.	Percentage removal by Septic Tanks and beds of albumenoid NH_3 over raw sewage.	Percentage removal by each bed of alb. NH_3 from septic sewage.
Raw sewage	19	2.935	1.406	29.13	....	....
Septic sewage	20	2.450	.723	27.08	48.5	....
Beds 1 and 2	13	.594	.172	20.23	87.7	76.2
Beds 3 and 4	10	.982	.169	21.08	87.9	76.6
Beds 5 and 6	11	.798	.133	20.78	90.5	81.6
Beds 8 and 11	7	.5735	.1159	20.40	91.8	84.0
Beds 9 and 10	9	.305	.093	14.83	93.9	87.1
Bed No. 12	8	.142	.080	21.05	94 3	88.9
Bed No. 13	8	.342	.089	22.82	93.6	87.6
Bed No. 14	8	.291	.118	18.37	91.6	83.6
Bed No. 15	3	.3413	.0437	18.43	96.9	94.0
Bed No. 16	10	1.176	.131	24.44	90.6	81.8

The average removal of albumenoid ammonia from the Raw Sewage for all the Beds was 91.87%.

The average removal of albumenoid ammonia from the Septic Sewage for all the Beds was 84.14%.

None of the Bed effluents were putrescible.

PART III.

By Wm. Mahlon Davis, C. E., etc., Berlin, Being Report of Engineer upon the System, Aug. 28th, 1903.

The subject of sewage disposal in general has been treated in such an exhaustive manner by the Government Bacteriologist in his report of last year, which is now in your hands, that I do not deem it part of my duty to consider other methods than those which the conclusions of the report based on the experiments here indicate as necessary for the purification of our sewage.

It would appear from this report that the following are necessary for the satisfactory treatment of the sewage:—

1st. Preliminary treatment of manufacturing wastes.

2nd Treatment of sewage in septic tanks with capacities equal to one day's discharge.

3rd. Land treatment of the septic effluent by intermittent downward filtration, the area of land required being based on the experience in Massachusetts plants.

I shall therefore discuss the best means of accomplishing this work.

Preparatory to beginning the work entrusted to me, I visited several of the sewage disposal plants in the New England States in company with the chairman of your sewerage committee. At Brockton, Massachusetts, the sewage of a city of 47,000 is pumped two miles to a disposal field of twenty-three acres; the filtrate is clear and odorless and there is not the slightest nuisance in the neighborhood. The soil is sandy loam, the beds are drained to a depth of seven feet with field tile, the quantity pumped to these beds per acre per twenty-four hours averaged 27,151 gallons for the year 1902, this includes periods of rest which are necessary to keep the beds in efficient condition, the character of each of the beds is studied by the engineer in charge and the size of dose and the length of rest period regulated to give the best results. The same satisfactory conditions found at Brockton exist at Framingham, Andover and Pittsfield. The Brockton plant was constructed in 1893 and has therefore been in operation nearly ten years; the results are now more satisfactory than at its installation.

The experimental station at Lawrence was also visited and much valuable information was obtained from the officials of the State Board of Health.

In designing a plant for the treatment of Berlin's sewage I consider it wise to provide a capacity in excess of our present requirements for those portions of the system that cannot be easily extended.

Quantity of sewage.– I have measured the dry weather flow of sewage from time to time during the last five years with the following results:—

1899, discharge per 24 hours, 225,000 gallons.
1901, discharge per 24 hours, 327,000 gallons.
1903, discharge per 24 hours, 414,000 gallons.
Increase from 1899 to 1901, 46 per cent.
Increase from 1901 to 1903, 27 per cent.

The great increase between 1899 and 1903 is partly accounted for by extensive additions to the sewerage system and to the diversion of the Breithaupt Tannery sewage from an independent outlet to the town system. It would, I think, be safe to assume that the increase for the next two years will not be more than 27 per cent. of the present volume, which would give 526,000 gallons per 24 hours.

Preliminary Treatment of Manufacturing Sewage.—I have already submitted plans and recommendations for the treatment of the sewage from the Lang and Breithaupt Tanneries, which contribute from 20 to 25 per cent. of the total volume of sewage; these plans and recommendations have been adopted and the works are in course of construction. Plans for the purification of sewage from the smaller factories requiring preliminary treatment are now being prepared and will be presentled at an early date. I am of opinion that on the installation of these auxiliary works a marked improvement in the character of the sewage at the outlet will be observed.

Septic Tanks.—I would recommend the construction of two covered concrete tanks, 150 ft. x 36 ft. x 7 ft. These would, with the existing tank, give a total capacity of 530,000 gallons which is slightly larger than the daily discharge estimated for 1905; now, although in the recent experiments the best results were obtained from a septic tank which was only required to treat daily a volume of sewage equal to its capacity, still a very good showing was made by the 60,000 gallon tank while treating daily 100,000 gallons. By working our tanks at this rate therefore the capacity proposed would treat nearly 900,000 gallons, more than double our present discharge.

Intermittent Downward Filtration.—I have made careful topographical surveys of the land in the vicinity of the sewer outfall to determine their suitability for filter beds. Of the two localities where it was reported satisfactory material could be obtained, that to the south on the A. E. Shantz farm is distant 2,400 feet from the sewer outlet, the surface is very undulating, requiring considerable grading to make it available, the sand is covered with from 1½ to 2 feet of clay or sandy loam; the area would be about sufficient for present requirements only, the elevation is 50 feet above the sewer outlet. The land to the north-east, on the Genz farm is 1,700 feet from the sewer outfall, the surface of the land is similar to the other location, the sand is in some places covered with 6 to 8 inches of loam, in others is bare. Ther are thirty acres in the tract I have examined by means of test holes and there is probably as much more of the contiguous lands that are quite as suitable. The elevation of the land would be 50 feet above the grade of the sewer.

In order to compare these materials with those in use in Brockton and those selected for the experiments by the Massachusetts State Board of Health at Lawrence, I forwarded five samples to the chemist in charge of the plant at Brockton for mechanical analysis; attached hereto is a diagram showing the results of these analyises. The samples "A," "F," and "M" were taken from the Genz farm, "O" and "P" from the Shantz farm. All of the curves shown on the diagram except "P" indicate exceptionally good material for purposes of filtration, the effective size of grain being satisfactory and extremely uniform. The green curve "P" shows so much variety in the size of grain that the interstitial space would be small, leaving very little room for air, and air or rather oxygen is absolutely necessary for purification of the sewage by this method. One of the beds which has given excellent results at Lawrence is of similar material to that found on the Genz farm (practically the same material can also be found on the Shantz but it covers a much smaller area). There is therefore no doubt of the material convenient to the farm being of the requisite quality, the elevation is such, however, that the sewage must be pumped to the disposal area. For purposes of comparison I have made an estimate of the cost of excavating the old beds to an uniform depth of 5 feet and filling the space with sand from the neighboring hills, this would permit of a gravity system of disposal; the initial cost would exceed that of the pumping system by $17,000, the annual saving in operating expenses would justify this extra expenditure were it not for two reasons, 1st, an extension of the area of the disposal field beyond the limits of the present farm would entail a very large expenditure; 2nd, the method of distributing by gravitation would not give as good results as those obtained by flooding each bed quickly by means of powerful pumps and giving a longer period of rest.

For the above reasons I shall advise a pumping system with the Genz farm as the location of the disposal field.

Pumping Machinery.—As I have stated, the best results are secured by forcing the sewage on to the beds in a short time, the pumps can also be operated more economically if run at a uniform rate, and a great portion of the time of the man who runs the pumps will be available for other duties. I am of the opinion that a three million gallon pump, that is a capacity of about 2,000 gallons per minute, is best suited for this purpose. This would deliver the whole of the daily discharge in between three and four hours and when our population has doubled would still be capable of doing the whole of the work during the day time.

Storage Reservoir.—In order to operate the pumps as I have described, a storage reservoir would be necessary to hold one day's supply. I would recommend building this reservoir of concrete with arched roof, underground. By constructing the reservoir and septis tanks in this manner, we would guard against any nuisance at the pumping station from the raw or untreated sewage. The capacity proposed for the storage reservoir, 472,500 gallons, may be assumed to be sufficient for double the present discharge of sewage. For when the quantity of sewage has reached this stage the pumps will require to run during the day so that the reservoir will at this time only be required for the night's flow.

Power.—As the works will be situated some distance from the railway station and the cost of delivering fuel considerable, I would advise operating the pumps electrically, the wisdom of this is more apparent since the electric power plant is owned by the municipality and the power would be supplied at cost.

Force Main.—The size of the force main should be such that the head pumped against will not be unduly increased by friction. 14 inches in diameter is the most economical size to use, considering the cost of pipe and quantity of sewage to be elevated.

Filter Beds.—The beds should be approximately one acre in area for convenience in management, the embankment between beds being composed of the surface material. The sewage carriers will be covered by the embankment, having a manhole at each bed provided with gates to regulate the flow. To distribute the sewage uniformily over the surface of the beds broad, shallow, open distributors should be used, extending clear across the beds.

The depth of clean sharp sand is, at the points where borings were taken, at least 12 feet and I am unable to say how much deeper.

Under drainage as usually carried out at a depth of 5 to 7 feet would certainly under those conditions arrest very little, if any, of the filtrate which would continue downward till stopped by the first impervious stratum; it will therefore be best to leave the details of under drainage to be decided when more accurate information has been obtained regarding the materials underlying the sand.

I have proposed levelling fourteen acres, assuming that material of this character can be depended upon to filter at least 30,000 gallons per acre per 24 hours. The following is estimated cost of works proposed:—

Estimates:—

Pumphouse	$1,000.00
Pump capacity	4,375.00
Motor, belting and counter-shaft	918.00
2 septic tanks, combined capacity 472,500 gallons	8,500.00
Storage reservoir, capacity 472,500 gallons	8,500.00
Cast iron force main, 1,700 ft. 14-inch pipe	3,851.00
Grading 14-acre filter beds	7,500.00
Carriers, manholes, valve chambers and other appliances for distributing sewage	3,160.00
Drainage	1,560.00
	$39,364.00
Add for engineering and contingencies	3,936.00
	$43,300.00
Land and right of way	4,700.00
Total	$48,000.00

In the above estimate I have provided for the construction of septic tanks because unless there is a material improvement in the character of the sewage the services of the tank will be necessary to treat it successfully. It is possible, however, that the preliminary treatment of the manufacturing wastes may have such effect on the sewage as it is discharged at the outfall, that we may be able to dispense with the septic tanks and effect this saving in the first cost as well as escape the troublesome problem of how to get rid of the sludge from the tanks.

Short Description of Sewage Disposal as Carried on at Berlin.

The outfall of the Berlin Trunk Sewer is in Schneider's Creek, about two miles south of the centre of the town. The usual flow of the stream is about twenty-four cubic feet per second, but in dry weather it would not exceed ten per cent. of this amount. At the time of the construction of the Trunk Sewer in 1891, a tract of land for the treatment of the sewage by intermittent filtration was prepared on the flat lands near the outfall, the soil however was unsuitable, the volume of sewage rapidly increased, while the multiplicity of factories making use of the sewers rendered the sewage most complex in composition and difficult to treat successfully.

In 1899 the daily discharge was 225,000 gallons, which ultimately reached Schneider's Creek, whether it passed through the filter beds or entered the creek direct made little difference in its character. Many complaints of the pollution of the stream were made by the owners of the adjacent lands.

In 1900 a septic tank of 60,000 gallons capacity and two screened gravel contact beds of about one-twelfth an acre each were installed as a tentative measure, and gave good results for a short time. They were enormously overworked, no attention was paid to them, and they soon sludged up, nothing further was done to abate the nuisance.

In 1901 the volume of sewage reached 327,000 gallons per twenty-four hours.

In 1902 Dr. John A. Amyot, Ontario Government Bacteriologist, was instructed to make an examination of the Berlin Sewage and report to the Government on the best method of treatment. Dr. Amyot with an assistant spent a season on the ground taking up the investigation in a most thorough manner.

The experiments of Dr. Amyot indicated treatment in septic tanks, followed by intermittent sand filtration, as likely to produce the best results, and that the sewage from certain manufacturing establishments should pass through settling basins before being admitted to the sewerage system.

In the latter part of 1903 a by-law was carried by the ratepayers providing for the construction of the works on the design of the writer, who was engineer for the town.

The septic tanks proposed were two, each 150 ft. x 36 ft., depth of the sewage seven feet, these with the small tanks previously installed would provide a capacity of 530,000 gallons, which it is estimated would give a fairly good percentage of purification, when the volume of the sewage had attained double its present proportions.

For the filtration of the septic effluent there is no suitable land available to which the sewage can be conveyed by gravitation, and the preparation of artificial beds being found too expensive, pumping was decided upon.

After an examination of all the land in the neighborhood and mechanical analyses of the various descriptions of sands, a farm about 1,700 feet from the sewer outfall was purchased. The surface of the land was very uneven, the elevations varying from twenty to seventy feet above the grade of the sewer outlet. The sand is clean and sharp and was covered with from six to eighteen inches of loam.

As it is very desirable that the daily discharge of sewage should reach the filter beds in a short time, both on account of the saving in the time of the man operating the pumps, and also of the more equable distribution of the sewage on the beds by this means, it was decided to provide two storage tanks of the same size as the septic tanks, thus giving storage for twenty-hours discharged, which could be pumped to the beds in four hours.

The tanks were constructed of concrete, roofed with groined arches and covered with earth to a depth of two feet.

Fourteen acres were prepared for filtering the sewage, being divided into sixteen level beds of various elevations. The loam was removed from the original surface and placed in the embankments separating the beds, the depth of filtering material was at least twenty feet and in some beds much greater. An effluent pipe of field tile was laid at a depth of six feet through the centre of each bed.

The raw sewage flows first through a grit chamber where heavy substances are arrested, it then passes through the septic tanks, alternately over and under a succession of baffle boards, so arranged as to distribute the sewage over the entire tank, from which it overflows into the storage reservoir.

The septic sewage is pumped from the storage reservoir through a fourteen inch cast iron pipe to one or the other of two distributing wells, from which it is diffused over the beds by gravitation.

The beds are used in rotation and given doses proportionate to the area, the tour of the sixteen beds is made in seven days.

As was expected the most of the filtrate misses the effluent pipes, percolates through the sand till it strikes the impervious strata and then appears in the form of springs at the base of the hills on all sides of the farm, where it has been necessary to collect and convey it to a proper outlet by means of field tile, to prevent damage to the adjacent property.

Weekly analyses of the raw sewage, septic sewage and sewage filtrate have been made in the Laboratory of the Provincial Board of Health since the installation of the plant about ten months ago. With reference to its physical character the raw sewage is usually chocolate in color, and the septic sewage not much lighter in appearance but with the matter in suspension eliminated. The filtrate is perfectly clear and odorless and in appearance cannot be distinguished from spring water.

The filter beds were given the first dose in January, 1906, when there was from twelve to eighteen inches of frost in the ground, which was gradually thawed out, but about six weeks elapsed before the whole of the frost disappeared.

The volume of sewage has now reached 680,000 gallons per twenty-four hours. The filtering material has not sludged up in the slightest degree.

The cost of the work was:

Septic and Storage Tanks	$18,000
Filter Beds and accessories	20,000
Pump House	1,050
Electric Generator, Motor and Pumps	6,700
	$45,750

Work for the treatment of sewage before admission to the Sewage System have been constructed at three of the manufacturing establishments: The Lang Tanning Co., tannery; The Briethaupt Leather Co., tannery; Huether's Brewery.

Experiments with the sewage from the Lang Tanning Co., Harness Leather Tannery, demonstrated that with a succession of tanks of which the aggregate capacity was equal to one day's discharge, a very large proportion of the organic matter was precipitated chemically. Accordingly four circular tanks, each holding 12,500 gallons, and each divided into two compartments by a partition open underneath, were placed in a row on an elevated trestle. The sewage which drains into a sump is pumped into the top of the first of the series of tanks, passes underneath the partition and overflows into the next tank, continuing in the same manner through each tank in succession, it passes from the last tank to the corporation sewer. The precipitate which has the same manurial value as barnyard manure, is drawn off into waggons from the bottom of the tanks and hauled away by farmers. The tanks were put in commission about twelve months ago and have produced satisfactory results.

At the Breithaupt Tannery three-fourths of the daily flow comes from the beam house, and being septic in character can be successfully treated in a tank, the remainder of the sewage is strongly acid.

A septic tank holding 60,000 gallons has recently been completed, the whole of the sewage will be passed through this tank, the acid sewage having first been neutralized by the addition of milk of lime. Provision is made for the removal of sludge by gravitation to sludge beds where it will be buried or dried and burned. As the tank has only just been put in operation, it is too early to speak of results.

At Huether's Brewery a small screen chamber has been placed, so designed, that the sewage is drawn off midway between the surface and the bottom of the chamber and passes through a screen, with the object of removing the grain husks, which would otherwise find their way to the filter beds and in time clog the interstices; for matter of this sort if kept wet is practically proof against decay.

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